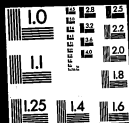


CENTIMETERS



14:1

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Thomas A. Edison Papers

A SELECTIVE MICROFILM EDITION PART V (1911-1919)

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at
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START

230

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**NOTEBOOK SERIES
NOTEBOOKS BY EDISON**

Notebook Series -- Notebooks by Edison
Notebook, N-14-10-04

This notebook was used during the period October-November 1914. It is the fourth of a four-book series, preceded by N-14-09-30. The entries, which are by Edison and an unidentified experimenter, pertain to the Condensite varnish surfaces applied to disc record blanks during the transfer and printing process. Entries toward the beginning of the book describe experiments relating to the ingredients and chemical reactions involved in making different varnish compounds. Among the subjects of Edison's experiments are varnishes containing varying amounts of phenol, alcohol, "para" (paraphenylenediamine), "penta" (penatchloraphenol), "6/4" (hexamethylene tetramine), phenylhydrazine, and other compounds. Archie D. Hoffman and Frederick Ott assisted him in these experiments. Other groups of experiments involved resin from the African sandarac tree and the synthesis of phenol (in short supply because of the wartime naval blockade against Germany) from benzol. At the end of the book is a four-page table by an unidentified experimenter summarizing the manufacture and condition of records made with varying amounts of 6/4 solution and varnishes from different numbered lots. Inserted into the book are several loose pages of notes by Edison pertaining to experimental varnishes made with dammar, a botanical resin. Another page contains a drawing of distillation apparatus, possibly by Jonas W. Aylsworth. The front cover is labeled "Disc 4 Records." The pages are unnumbered. Approximately 60 pages have been used.

15 E

25 phenol
6 1/2 6/4
1/2 Para

3 Chlorinated Solvent Nap
5 Doss 5 gms hot Alcohol

Hard to get any resin -
Crystallized out bad -

16 E 25 phenol
6 6/4
1/2 Para
6 Chlorinated Solvent Nap

Went very thick & Crystallized
out bad, not much resin -

Toward end when thick
& foamed bad - No 17
didn't,

17E

25 phenol
6 6/4
1/2 para

3rd Penta Rad like crystallized
from alcohol by Neg.
The penta from which
this is made from is
alkaline Sal penta got
out by Neg -

This crystallizes out like
all the others 15+16
while alcohol is evap
but when it evaporated
the 6/4 dissolves good in
the phenol penta & makes
a high yield resin
& good

Evidently the function of ~~the~~
Penta is to prevent 6/4 from
crystallizing out as it makes
it more soluble in phenol
& resin & prevents segregation
in vacuum after ~~from~~

18E Test tube full saturated
alcoholic 6/4 - marked test
tube full of ^{light} alcoholic alumina
about gram on 1 1/2 g - creeps with
without para - crystals both lines & frost like

19E Test tube full sat 6/4 -
1 gram Negs alcoholic Extract
solid from Alkali Salt Extraction
Penta: - This is not very soluble
scarcely 1/2 went into solution
creeps & without para fine white sediment
coating of crystals all over not only but dry
with para & still wet & also apparently crystalline from creeps
22 is better than 19

No 20 Dup 18

Except 1 gram Alpha Naphthol
not much Crap in either Case
Can't tell any with 4-alkanol para
para keep liquid, + there is a
red ~~color~~ as the violet both with water
on Syringe Especially with Para
this.

21 Dup 18

Except 1 gram Chlorinated
Naphthalene made by Grath
No good apparently with alcohol
develop some Crap when
Cold precipitates out -
No good (Crystallized) Emul

22 Dup of 18

Extracted by E from Crude Paria
by Alcohol No Alkali -

1 gram
after pouring out + shortly after
Considerable of Cocaine but ~~diff~~
comes out in liquid

There is no crystallization - "settles out
as mud - very little Crap
compared to 23 - only bad feature if it is
bad is that unlike other chemicals in
this group a large amount settles
out slowly when alone or with alcohol +
more comes out as it warms.

23 Dup of 18

Except 1 gram Gum Dammar

Weight of Alcohol used in all
from #18 to 22 is

16.710 grams

23
This seems to prevent crystallization
to a certain extent
It is no better with para than ^{with overland} para
without considerable Crap ^{than}
think this is good - 5-alkanol 500

As far as 18 to 23 Expts

The pentol is not by Nix leaves fine crystals 19
22 " " Ethanol in comes out as
sediment but there is no final crystal
of 6/4 still with or without Para has
simply a mud when all trap in
both Cases +

23- Dumas feel no crystals in either case
think this will prevent 6/4 from forming
crystals of any size.
It difficult to dissolve in alcohol
must find something to add to
alcohol to increase solubility

20- This may help if free phenol is
low must be quite low of only
2 or 3% used.

All these Expts and temp
Amount of material dissolved or showed
have dissolved in 1

Alcoholated with 6/4

18- unknown

19 8.6 gram in 145 grams Al-but did not

20 8.6 " " all dis

21 8.6 " " Very little dis

22 8.6 " " Nearly all dissolved 80% dis

23 8.6 " " 70%

Equivalent to 8.6% of Benz. full dis -

860- Mfg of Para dissolved in 145 al. all dis
no precipitates -

On heating 20 Condenses =

Looks as if Dumas & Edison Extract
of Pentol - using 2 para + 4 pentol
instead 6 to stop getting out of
mud would be best, for Dumas -

Notice 22- Part left in bottle
nearly all mud settled out its
undoubtedly no changed by pulling
in some alcoholic Dumas -

22 = I also notice that a new portion of 22 is very colorless. Over Alcoholic Ammonia + 6/4 seems to dissolve OK.

Note - No 24

50 alcohol DEN -
at 80 Fahr just possible
by much shaking to
get 5 grms 6/4 dry into
it = at 66° Fahr in ice
chest nothing crystallizes out.
I now add 1 1/2 grms penta soln
Alcohol. Washed & extracted by Edison
- nearly all dissolved, light flocculent
stuff very minute in quantity.

Note, 50 grms alcohol
4 grms water added
enormously increases
solubility. 24

Note

Note, phenol solid if little alcohol
ammonia put in just enough to make
it liquid & no more, increasing its
bulk very little, Does not go
solid in Refrigerator close to Red -
English

No 25

Note = at 82 Fahr 50 grms
our Reg DEN alcohol
~~sent~~ to which 4 grms alcohol
added Dissolves 8 1/2
grms 6/4 nearly
twice as much as alcohol
alone — nothing chills out at 70°

Note - from Expt 22

Edison Alcoholic Extraction reg
Penta - Muddy - by adding
22 little Alcoholic Ammonia
Clears some - adding water
just a little clears it more -
Residue in flask from 22 Expt -

25 Continued I put $1\frac{1}{2}$ gram
of Alcoholic Extract from beaded
Pentia made by Edson - it
dissolves about as well as in
24 - Can't say that there is
any more flocculent undecanted
in 25 than 24 - by close
examination appears that
25 is more muddy than 24.

At 552 I poured equal quantity
of 24 + 25 on two bottles labeled
in at 554 No 24 shows the
Pentia precipitating fast
no signs of precip in 25
at same time,

6 in largeness comes out 24
4 clots - some coming out of
25 -

at 505 - about same much has
come out of 24 + some out
25

If there is any
favorable symptom it favors
25

I now put 1 gram of
Para in 24 + 25.

this is equal to $3\frac{1}{2}$ Para
in Tannish -

Both 24 + 25 Pentia settles out
but not so quick as without it
also it don't clot but always
fine - both act about same
25 Sol seems got thicker than
24 on little plate.

I now put 2 grams
Alcoholic Ammonia in
both 24 + 25 - rough
measurement -

Seems to keep cleared +
don't notice settling out in
10 minutes but do hard to
see Sol down

25 with + without Nitro shows same
Complexation seen on top - beakers
In 13rd paper in 5th I guess - Pentia don't seem
to be so much like the hard to see

Oct 4 Sunday

We now put in 30 grams
Resin in 24 + in 25

24 + 25 - Before Resin -

Notice Alcoholic Ammonia in
24 - that it goes way down
+ still appears liquid + pretty
clear - 25 has appearance
of 6% because its darker

This looks as if a little
ammonium had everything
clear in 24 to the end
of May 62 Useful

Especially when Resin is in

Oct 4/14
Gave Hoffman following
1 gal lot of vacuumed to
make -

Use all the same resin + as
near 16.5 % phenol as possible
bring to 22% phenol

26 2 para 7.9 $\frac{6}{4}$ 2% alpha naphthal
27 2 " 7.9 $\frac{4}{4}$ 3% Gum Dammar
dissolves in at 150°

28 2 para 7.9 $\frac{4}{4}$ 2% Penta
29 3 para 7.9 $\frac{4}{4}$ nothing else
keep cool.

30 2 para 7.9 $\frac{4}{4}$ 4 Penta 1% water

31 2 para 7.9 $\frac{4}{4}$ 4 penta 3% water

32 2 para 7.9 $\frac{4}{4}$ 3% strong ammonia -
put ammonia in alcohol first
before dissolving other things -

Meto-Mela cresol is only begun
not crystal like Parac or either it
may be this that gives oil in
Petrol as it probably not
Chlorinated as much.

Phenylhydrazine $C_6H_5NH.NH_2$
Boils 233 Cent Solidifies when
Cold to plates which melt
23 Cent Very Sol Alcohol
Used for detecting aldehydes
Ketones \rightarrow Oxidizes in the air
Night candles - phenol melts 43 C

Benzotrichloride - phenyl chloroform
made from Borling Toluene
by Chlorom - $C_6H_5CCl_3$
yellow begun - powerful
odor Boils 213 Cent
used in Antine Dye industry

Perhaps Van wants something
extremely inflammable
at and more combustible like
the stuff in petrol.

I had an old Van on my desk
made thus

145 Alcohol

100 Resin

4 Trichlorophenol

$\frac{1}{4}$

$\frac{1}{2}$ pure

6.6 Free phenol put in

It was pretty thick even on table
3 or 4 days

I put in tonight 6 grams of
Alcoholic Ammonia & shook it
I noticed when poured on
dish it was convex when

24 & 25 were concave

25 didn't have all its resin
dissolved but only 2 or 3 grams
not diss - 24 had some $\frac{1}{2}$
gram not dissolved,
put in circle 9.10, for put on
October 9.52 pH -

at 10.5 Old Var gives some gas
bubbles - 24 + 25 clear

24 + 25 at 10.15 both Rubbery

24 has very few fine bubbles
25 has considerable fine
+ old Var has many but none big

24 has hills on surface
but no bubble corresponding
to the hills.

The old is now rubbery
at 10.30 pm -

At Rubbery stage larger
bubbles appear on 24 25 -
+ old -

24 with 10 grains water
Rubbery at 10.40 pm -
some few bubbles but least
of all -

24
10% water
dried out like
out 15%

In No 24 - I add 10 grains
of water + shake, it keeps
clear but appears to
thicken - pour on better
dish -

Put in 8 more grains
This is too much clear
it -

on adding the 18% water
Var settles out in center &
separates from the water

although 10% 24 has not
done it it clear -

at 10.45 #24 10% water put
right on hot plate 1 minute dissolved
again in water + went rubbery

Guess since exp 24 15% H₂O went
missing so quick is because
I put it on metal of plate
but only for a minute + then
put it back on asbestos
at 1050 put 24 + 25 right
on Metal of plate also old Van

✓✓
✓✓

All these Expts with 24 + 25
Shows that Water may play
an important part in the
Varnish

Also that a surprisingly
large amount of water
can be used without
apparently effecting the
Varnish -

On account of the great
solubility of $\frac{6}{4}$ in water
a little water in Varn
will keep $\frac{6}{4}$ well mixed
with the resin + prevent
crystallization also keep
free phenol liquid + prevent
it from crystallizing from
the cold produced by
rapid evap of the alcohol
Perhaps the ammonia helps

to keep the scula in solution
& possibly this var soaked
with para then if only
para used

The old var seems NG
puffs up - lots bubbles &
Rotten - it was $\frac{1}{2}$ fused
any way -

Took all off - at 11 pm
stripped - 10 + 18% water
No 24 has white bottom
where water settled -
Looks as if 5% water
was limit - but 7%
on thin flat plates where
there is no low places for
water to concentrate,

All are rubbery but none are hard
& leave them on all night

24 + 25 right on plate for several
hours covered so hard all these
 $\frac{1}{16}$ to $\frac{3}{32}$ is thickness of middle
Cut curly but its very hard

24 with 10% water also curly
even tougher than without
24 with 18% water even better

Note - Used so much $\frac{1}{4}$ in all
that ~~has~~ none become plastic
at heat of plate 240 feels
probably not at any heat,

Try Phenetal

Ethylic Ester of phenol.

Ethyl phenate.
or Carbamate -

By heat, Na Sulphovinate with
Naphenylate

$C_6H_5-O-C_2H_5$
Only liquid Boils 172
Sp Grav 0.9822

Anisol -

Succinic acid

Phthalic acid

I find Phenylhydrazine is procuring
as to a liquid at ordinary
temp, thick oily - It dissolves
some 6/4 - saturated with 6/4
it don't condense, vent volatile -
+ will stay as a liquid in
Vencer - but let phenol 4 p
to say, 1 phenylhydrazine with
alcohol + strong 6/4
poured on dish it condensed
to fine deep red brown with
fine surface No bubbles
although put plate right on
240 Fals looks extremely
promising -

Phenylhydrazine from Anilin by
Diase reaction + reduction affords
Yellow and brown oil $C_6H_5-NH-NH_2$
Absorbs Oxygen from the air + reddens
slightly Sol Water Soluble to plates in
Cold melt 23 Cent Boils 241-2 -
Keep with stoppered bottle -

29

25cc Reg Var 903
5 gram phenylhydrazine
at 1030 NG all fratched up and
condensed about 5 min

still 26-27-28-29 poured on flat
white bottles describes cut 615 pm
Oct 6th 14 at 7.50 thick beautiful surface
glutens no sign of a bubble
at 7.55 all put on bottles on hot
plate in 2 min some very fine
bubbles appear 29 the most
26 2nd - shows the net the phenylhydrazine
at 9.35 pm none have gone rubbery
26 + 27 about same bubbles as originally
28 more + larger + 29 has more
of fine bubbles looks as if
cooked
at 9.37 pm put all right on metal
of hot plate

Experiment with Phenylhydrazine

26

25cc Reg 903 Var
1 gram phenylhydrazine

Rubbery at 9.50 pm -

This is only one any good, the shell in rubber
stage at 10.30 pm looks off - it puffed in one spot
don't stick to plate - looks good to work
with 100 @ 200 ml - 1 gram evidently too much -
+ other thing - 903 may react with the Am making
new hot Var 27 without penicillin

25cc Reg 903 Var
2 gram phenylhydrazine
Rubbery at 10.7.

7

28

25cc Reg 903 Var 3 grams phenylhydrazine
put on hot plate 10.50 pm ^{all} rubbery all
puffed up NG abandoned -

Note 1 gram phenylhydrazine too much
the 10% of Resin - think -
from 100 to 250 milligrams better
may be ok = 1

34 - Drop of 30
100 milg Glacinal phos

The Glacinal even 100 milg
don't seem to dissolve
at all - Guess whole
Experiment is a failure

Put in tulle dishes at 1130 pm
dried all night put on
Cisternas 930 am
Look good -

All these come off the dish
Easy + free off at 230 pm
but I have neglected them +
they were probably OK long
before this - no lefts + means
in bubbles since dried
30 + 33 scarcely any bubbles
33 the least

May be something in
30 & 33 phos acids

Drying Effect of Acids -
30 -

25 cc Reg Var 903
250 milg Glacinal phos acid

31

25 cc Reg Var
500 milg Glacinal phos a

32

25 cc Reg Var
1 gram Glacinal phos a

33

25 cc Reg Var
2 grams Glacinal phos acid

The spots of undissolved phos acid is seen
in the lower face of the mass -

I find if mineral is already dissolved +
strongly alkalal dissolves an unlimited
amount

Poured out at 1100 pm in
bottles & dishes - dried all night
this morning Tuesday at 930 am
found all full of bubbles
showing recent & chemical action
put on the scales at 930, am

Huffman Gret in some
Resin he marked Nat
dehydrated or some
marked ~~by~~ dehydrated

The Nat Delhy had by least
16.6 free phenol

The Dehydrated
14.8% free phenol

34

Instead of using reagent 903 I make following

34

20 grams Resin

29 alcohol

1580 Mils 6/4

200 " Para

100 " Phenylhydrazine

35-

Dup but with 200 Mils Phenylhydrazine

36

Dup with

400 milg

"

37

Dup with

800 Mils

"

they all bluish but 37 slight red tinge
shows reaction evidently -

~~second and third if the~~

38 39 40 glass
Phos separates but
39 the least bubbles -
40. Rubbery almost immediately

Phenomenon

Only want a very little
 $\frac{1}{10}$ of a % to $\frac{1}{5}$ % of the
Resin -

Note = $\frac{6}{4}$ starts to decompose
around 200 Fahr + sublimates
a little at 210 Fahr -

38 ^{1 + 2} Dup

703 Van Wick found in ice box -
added about gram or gram + $\frac{1}{2}$
spray phosphoric glass -
poured two bottles dishes, lots
bubbles from shaking the
varnish -

39 -

Dup 38 - but 5 grams put in of phos

40

7 or 8 grams put in precipitated
out lot stuff -

Id effusion made for me
a little Var, for use in
Expt 4 - now in ice chest

100 Resin 1616 fresh -
5H, Extra phenol

7.9 6/4

140 alcohol no Para or Para.

X045 is a little Para put in
Colors Var white, precip -

41 = 42

I put $3/8$ high in round part of $1/8$ " test
tube of gelatine phosphoric acid &
then filled test tube with alcohol to
within 1 inch of top & used about 25 cc
of Reg Var without Para or Para
Aspirin in $3/8$ inch of length of test tube
in 41 & 42 & poured - then put
in same bulk again in Var & put
it in 43 & 44 I noticed precipitate
white. Think it precipitates 6/4 out,
100% put on alcohol too quick lots, bubbles
Condense in 1 hour

43 & 44

When put on alcohol too quick
lots bubbles, Condense in 1 hour

I have tested it & find phos acid does
precip 6/4 but it dissolves in excess
of alcohol & therefore will be off
dissolves in the Var if small
 $1/8$ phos acid used
Later = I find phos acid precipitates Para
white dot red above

46 = Var no para or penta
Big pencil hydroquinone -

Either small quantity of
Glacial Phos syrup
or Hydroquinone makes
a smear on butter dish
that cannot be scraped
by the finger nail
& is tough cut like
cellulose after being on
hot plate all night

Using Reg V without
Para or Penta
PHENOMENON

Old Penta NG washed acid from
water boiled out -

20 grams put in -

100 at 50 water

100 at 25 "

100 at 20 "

100 at 15 "

100 at 10 "

100 at 5 "

100 at —

All are filled
+ drying

Old Penta
The alcoholic solution is light yellow
& even 100% at is light
Whereas New Penta is deeper, after filling
Old Penta dont give a purple out of alcohol
whereas New Penta on standing does
but OP may do so when it stands
same length of time,

Old P dont appear to have much dis
out by 100@50 water whereas NP
appears to have considerable

Weight Residue after alcoholic Extraction

#41

Al	H ₂ O	Old Resin	New Resin	Old Pent	New Pent
100	50	14.720	14.640	5.280	5.360
100	25	8.680	10.590	11.320	9.410
100	20	7.720	8.810	12.280	11.190
100	15	7.420	7.550	12.580	12.450
100	10	8.660	7.110	11.340	12.590
100	5	4.610	4.860	12.390	15.140
100	5	7.020	6.940	12.980	13.060

20 grams used

New lot pent 85 @ 90% good
Transfers -

100 Al	50 water
100 al	25 "
100 al	20 "
100 al	15 "
100 al	10 "
100 al	5 "
100 al	0 "

all are filled & drying

Sandarach Resin is very peculiar
dry from alcoholic sol like var
when cold brittle not sticky when
heat not sticky has fine surface &
film like var. Resin - Copals
desolve very little & on butter
dash globules & are sticky hot.
Both Mastix & Copals

Hoffman is making 10-gal batch
Req Var 7.9 $\frac{6}{4}$ NO Penta or Penta
but with $\frac{1}{2}$ per cent of phosphoric
glacial syrupy acid -
called the acid Phenolate -

that is all 95% Alcohol will
dissolve, so this must not be
exceeded,

90% alcohol. 150 g C -
and $7\frac{1}{2}$ CC. water added
making 157.5 CC dissolves
1 gram + 250 milligrammes

I now put 250 milg more
Chloride of Ammonia in to
see if it will dissolve
by long shaking 250 more
milg of NH_4Cl dissolves
making $1\frac{1}{2}$ grams all together
in 157 $\frac{1}{2}$ CC 90% alcohol.

later 3rd 250 milg more gone in
making 1.750. grams altogether
The 4th 250 got in - making
2 grams to 157.5 CC alcohol
90% -

See further down

Old Expts using Chloride of Ammonium -
5% only 38% is soluble - r

385	-	free release	Transfers	100%	no para or Penta
511	"	"	"	83% or 100%	Concl "
512	"	"	"	83 or 100%	Concl "
513	"	"	"	58% or 75%	Concl "
514	"	"	"	91% or 100%	Concl "
540	"	"	"	79.1% or 87.5%	Concl 2 Para

See next page

All plates from ovens look very bad,
pockmarked, matte surface, very few discards
Transfers slightly smudgy

looks good - May be we
use too much NH_4Cl .

150 CC of Alcohol dissolves as
a maximum at ord temp One
gram of Chloride of ammonia
This if 145 of al to 100 of Resin is
One per of Chl Ammonia to 100 Resin

Evidently 1.250 grams Methylcaine
 be put in 95% alcohol
 possibly 1.5 if short long enough
 & perhaps a little water -

Note, Paraphenylenediamine
 The Chloride is valuable in
 alcohol & may be preferable
 to Chloride of Ammonia

Get piece Sandarach Resin gum

Chloride Ammonia No. 1000000

	Trans	OK	Comst	Ckd	Pulls	Dist	Scrub	OK %
511	12	10	2	1		1	1	83
512	12	10	2	2				83
513	12	7	2	1		2		58
514	12	11					1	91
540	24	19	2		2	2 1/2 Pina		79.1
385	13	13						100

All free release -

Those that marked Ckd were rated
 Commercial probably very small
 Cks -

Oven%, good but plates pockmarked
 & looked very bad

These were on old Cress blanks
 which probably produced the
 Cracks -

Gum Kino dries to film - not sticky
 its fragile brittle film - probably
 Soluble in water for 3% sol in
 alcohol - Worth trying

Dragons Blood, dries up & white
 at 220° fah is dry shiny non
 sticky film acts like Sandarac
 but somewhat brittle at 175° & 200°
 whereas Sandarac is tough
 like Conkumale

This Dragons blood is amorphous
 gives shiny surfaces
 Dissolves fast in alcohol
 Its a little bubbly but was
 too rapidly dried

Gum Theri dries sticky

Kauri " "
 Euphorbia " "
 Myrrh " "

Ammoniac film not sticky after 220°

Quercus " not least sticky " "
 hard and smooth doubtful if sol
 enough

lb

Aloes	13 @ 14
Arabic	30 @ 35
Ammoniac	30 -
Euphorbia	20 -
Gamboge	80 @ 90
Gumac	16 @ 35
Kadaya	16 @ 25
Kino	50 -
Mastic	100 @ 110
Myrrh	25
Olibanum	12
Sandarac	28 @ 30
Scammony	225 @ 230
Senegal	14 @ 22
Thur	250 lbs 900 @ 1000

Dragons Blood 45 to 50 cents lb
 Elemi 45 c (more and) probably less

Gamboge after 220° Dry film
 Mink 3% will dissolve -
 Scammony very thin film fragile very
 little dissolves - Senegal only trace
 dissolves

Olibanum showed say would
 diss to give 3% - its tough like

Elemi

Elemi is quite sol in alcohol at 200° OK
 nothing comes off soft & translucent

Reg resin 16.6 free phenol.
500 grms saponified by NaOH.
Then precipitated by HCl -
filtered - The acid solution
contains 5 or 6 grams of
what appears to be Rosolic
acid probably some Resorcin
probably the resins very
very much & some have more
or less of Rosolic & this
to extent of 1% or more
Possibly this is one of
the things that gives us
trouble at times for 24 hours
on hot plate keeps becoming
so thick like sticky liquid
Cold its solid but viscous &
is sticky -

Try to Condense it with
6/4 but don't do much

Sandarac Resin. Almost
entirely saponified & made
soluble in water by
boiling = precipitates
OK -
Cannot get clear solution
by filtering - even with
Blond bleach -

Powdered Sandarach
Washed in boiling
water, water that
comes thru cloudy
probably this is
good way to purify
when it reaches a
boil it goes together
but when cooled all
comes apart & dries

very muddy on filter
papers -

This is good way to
partially purify

Also Sandarac
decolorous in NaOH.

Turns brown -

precipitates OK but
cant get clear

solition even with
Bone black - this
runs thru & blackens
filter

The Sandarac should be picked
by a girl to get chips out.

Probably we shall have
to get rid of the small
amount of Resin which
boils away decomposes
at 212. It is this which
probably makes bubbles.

I melted Sandarac but it
dont melt to clear but
froths awful & I keep it
melted for 1/2 hour but
still frothed bad, turned
darkish red. Water ~~clear~~
clear & a little opalescent
large amount of resin
order sneaker came off
think this will be necessary

to get rid bubbles -

I am also treating with
NaOH, & precipitating

Oleum dissolved to
Calcium with lots of
dried gives no bubbles
if dried all night on glass
plate 1" high over hot
plate, & then put right
on iron steam plate
240° Don't give any
bubbles like Sandarac

Resin brittle but not very
brittle - pretty good

Resin for us - it's also
Resin hard here 20 yrs
that new resin which
is softer -

Semi Melted Sandarac washed
then dried & powdered turning
yellow - 25gms dissolved
in 60cc al - poured on heated
dish set on glass plate over
hot plate 1" therefrom, still
gives big bubbles so this
process don't do to
stop bubbles & left in
oven -

Still have another plate
drying near hot plate. Show
about no bubbles -

From Grdin Vol 17 429

Sandarac dissolved in Alcohol -
then add Alcoholic KOH, this
precipitates Gamma Resin -

Alpha & Beta resin remain in solution
add 60% Alcohol this precipitates
Beta Resin -

The Solution Contains Alpha

When the precip produced by
Alcoholic KOH from *Alphalus*
Sol of Sandarac is boiled
repeatedly with 84% Alcohol
The Beta resin Compound with
KOH dissolves -
This leaves the Gamma resin
with KOH. This is dissolved in
60% Alcohol & decomposed
by hot HCl. It's a different
fusible body

Rutter description
N9 -

Oct 16/14
Sandarac

Part dissolved by Benzal is about
1/3 perhaps less. It is the beautiful
clear resin pulls out to threads
like finest spider web 1 foot long
Its Sol in alcohol readily

The part not dissolved is light
& infusible right on hot plate
dissolves alcohol - after filling
gets cloudy again -

Hard to say which resin
does the toughness -

Fred Ott is separating 3 lbs
with Benzal to make a
test.

They are certainly different
Resins entirely - That dissolved
in Benzal gives no bubbles,
white color - perhaps it will
with alcohol on account
of the water in alcohol

Using 1500 grams of Sandarac
powdered & extracting it
with Bengal C P I find
 $\frac{1}{3}$ rd of it is soluble in
Bengal & gives a very
beautiful Resin. transparent
& when warm can be pulled
into threads as fine as
Spider webs 3 ft or
more long - it will melt
& stay semi viscous on hot
plates 240 Fals for days
without changing
The Resol is white powder
forming $\frac{2}{3}$ of it

Oct 16/14 two
I am making a 10 gal
run of Varnish using
both Resin & white resin
to find out which
produces the good
results - I want to
get rid of bubbles in
Resin & get out the
impurity that gives
them -

11 Nov 1964

Experiments are being planned from
Benzyl - WE find the
time from neutralizing the
 H_2SO_4 & Benzyl Sulfonate of lime
by lime is hard to get lime
free by better pieces, by
washing under pressure
25 lbs - WE get 25
lbs water extra for each
lb of phenol which
is excessive - I have
just tried getting out
Benzyl Sulfonate
by Displacement Column
Column 23" long - 6" is filled
with the pulp - 17" water

seen if the water is colored
blue by turbine -

took 1 hour to run thru before
blue showed -

~~from~~ This contained pblly 80%
of the Recymen subfossil of Kinn
210 cc - 1 hour

2nd lot water came thru turned
blue - 35 minutes 140 cc

3rd fraction took 40 minutes
180 cc - very blue

4th fraction 110 cc took
30 minutes very blue

Displacement Expt.

2" glass tube · 12" - 6

Sludges -

		Benzene 503	90cc
1	270 cc water -	10.8%	29.20
2	275 "	8.5	23.40
3	85 "	0.4	0.34

- 4 Blue - 60 cc
- 5 50 cc
- 6 110 cc
- 7 50 cc
- 8 70 cc
- 9 50 cc

no Benzene 503

9% solution

of Benzene 503 in water

Too much water

Think if 100 of 1502 tubes
it would show percentage
all there is in

The Dqz was here also
by the Benzene 503 + 4250 fl.

OCTOBER
1914.

PERCENTAGE

OVEN. —

TRANS FFR: -

TESTER.

DAY	TIME	WIND	LAT	LONG	PLATE	DISPOSED			OTHER	TOTAL	TOTAL	BLANK	GRADE	OTHER	TOTAL	TOTAL	REWARD	FEDERAL	GRAND	TOTAL	TOTAL	REWARD	
						UNWIND	DISPOSED	SUBSIDIARY															DISPOSED
1070	661	8.4	675	11.5	5.1	35	60	331	2.6	262	5.1	331	2.6	262	5.1	331	2.6	262	5.1	331	2.6	262	
1071	663	8.2	3455	33.1	61.9	1.2	287.8	306.9	67.4	1071	663	8.2	3455	33.1	61.9	1.2	287.8	306.9	67.4	1071	663	8.2	3455
1072	665	8.2	3591	35.1	36.1	1.4	3.1	1558	10.6	1072	665	8.2	3591	35.1	36.1	1.4	3.1	1558	10.6	1072	665	8.2	3591
1073	667	8.2	3402	34.1	53.9	1.2	2.6	1422	126.9	1073	667	8.2	3402	34.1	53.9	1.2	2.6	1422	126.9	1073	667	8.2	3402
1074	667	8.4	3482	34.1	32.1	1.3	2.7	1631	68.4	1074	667	8.4	3482	34.1	32.1	1.3	2.7	1631	68.4	1074	667	8.4	3482
1075	672	8.2	3440	34.1	105	1.1	70	1760	54.9	1075	672	8.2	3440	34.1	105	1.1	70	1760	54.9	1075	672	8.2	3440
1076	671	8.4	3532	35.1	72	1.3	1.35	1780	54.9	1076	671	8.4	3532	35.1	72	1.3	1.35	1780	54.9	1076	671	8.4	3532
1077	676	8.6	3440	34.1	176	1.3	1.35	1583	106.7	1077	676	8.6	3440	34.1	176	1.3	1.35	1583	106.7	1077	676	8.6	3440
1078	677	8.2	10670	7.1	143.1	1.3	1.63	5249	162.9	1078	677	8.2	10670	7.1	143.1	1.3	1.63	5249	162.9	1078	677	8.2	10670
1079	677	8.4	9140	9.1	147	1.3	1.63	4339	162.9	1079	677	8.4	9140	9.1	147	1.3	1.63	4339	162.9	1079	677	8.4	9140
1080	680	8.2	9224	9.1	128	1.4	1.41	4512	225.5	1080	680	8.2	9224	9.1	128	1.4	1.41	4512	225.5	1080	680	8.2	9224
1081	682	8.2	4239	42.1	66	1.4	1.29	5043	149.1	1081	682	8.2	4239	42.1	66	1.4	1.29	5043	149.1	1081	682	8.2	4239
1082	684	8.2	10504	10.1	88	1.4	1.29	2018	155.1	1082	684	8.2	10504	10.1	88	1.4	1.29	2018	155.1	1082	684	8.2	10504
1083	679	8.1	3524	35.1	45	1.4	1.45	2659	143.9	1083	679	8.1	3524	35.1	45	1.4	1.45	2659	143.9	1083	679	8.1	3524
1084	686	8.2	14457	78	0.17	1187.9	61	0.14000	1000.7	5025	183.5	1084	686	8.2	14457	78	0.17	1187.9	61	0.14000	1000.7	5025	183.5
1085	678	8.2	6475	0.1	11	3800.0	0.1	3500.0	17.7	1340	57.1	1085	678	8.2	6475	0.1	11	3800.0	0.1	3500.0	17.7	1340	57.1
1086	690	8.2	1370	10	0.16	1000.0	0.1	1000.0	17.7	1187	28.5	1086	690	8.2	1370	10	0.16	1000.0	0.1	1000.0	17.7	1187	28.5
1087	692	8.2	12278	73	0.2	0.50744	31	0.50744	692	3521	127.7	1087	692	8.2	12278	73	0.2	0.50744	31	0.50744	692	3521	127.7
1088	696	8.2	4388	62	1.53	1	57.2	5.1	2.56	2073	58.1	1088	696	8.2	4388	62	1.53	1	57.2	5.1	2.56	2073	58.1
1089	697	8.4	5405	21	0.50	1	11	242	53.4	2595	155.5	1089	697	8.4	5405	21	0.50	1	11	242	53.4	2595	155.5
1090	699	8.4	5706	73	71	1	136	37	1	2566	87.4	1090	699	8.4	5706	73	71	1	136	37	1	2566	87.4
1091	701	8.4	12777	67	0.125	1	224	24	0.53	5340	727.5	1091	701	8.4	12777	67	0.125	1	224	24	0.53	5340	727.5
1092	703	8.4	674	4	5	2	10	1	0.9	327	11.3	1092	703	8.4	674	4	5	2	10	1	0.9	327	11.3
1093	704	8.4	670	1	0.1	1	11	2	0.87	295	6.2	1093	704	8.4	670	1	0.1	1	11	2	0.87	295	6.2

TESTER

[illegible]

[ITEMS(S) FOUND IN BOOK]

8.2

Feed line

2.4

Cracked

3.2

Holes

7.7

Poor Print

2.4

8.4

Feed line

1.4

Cracked

4.2

Holes

3.6

Poor Print

1.4

[ITEMS(S) FOUND IN BOOK]

Dummar

399 12 Trans 9 OK 3 second hand OK - No discards present
 485 12 " 5 OK 3 " 3 pullout - 4 discards present
 486 12 " 6 OK 6 disc - 4 pullout 2 OK 2 discards
 487 24 plates 4 Discs 2 OK 2 2nd Trans 1 OK 2 disc
 all have bubbles - 7 plates no crop 20 plates OK
 Not tested 116

519. 24 plates 12 Trans 11 OK 1 Disc - OK - present
 Final kept Trans - 9 OK 2 discards 1 2nd small crop
 some bubbles on all plates. 5 plates, discards
 Crooked 1 - marked good 75% 45%

538 24 para 23 Disc 20 OK 3 Disc - (2 OK 1 pullout)
 Very good free section - Transfers final
 unpop. OK 19 Discards 4 OK -
 46 plates 2 discards 2 1st round - 2nd round very
 good 82.6

12% or 53% 50% 6% Too much -

3% with 2 para is best

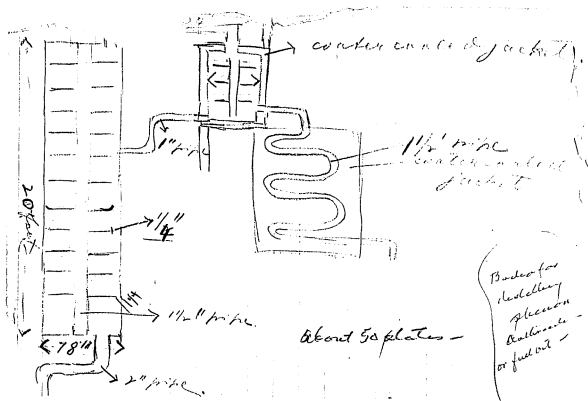
Probably 2% soluble is

better - Even 1% might be just the thing

[ITEMS(S) FOUND IN BOOK]

1006 Reg 903 but only 7.6 5/4	305	52%	PO 118	20
1007 - 2 para 7.8 5/4	200	73%	20	3
1008 - translucent 2 5/4 1 1/2 Para	216	74	39	1
1009 (903) Scepter 7.7 5/4 1 1/2 Para	273	31%	162	2
Reg	5281	70%	1292	15
1008 25% Phased 1st Para 1 1/2 Para	312	67	62	39
1011 16.5 2 1/2 Para 4 1/2 Para 4 1/2 Para	306	65	66	36
1012 16.5 Para 1st Para 4 1/2 Para	297	79.8	45	15
1013 15.4 5 1/2 Para (903 Para) Scepter 1 1/2 Para	323	76	46	29
901 16.6 1 1/2 Para 8 1/2 Para	282	76	2	62
1018 16.6 7.6 5/4 2 Para	100	75	10	15
1017 16.6 7.6 5/4 2 Para	100	72	15	10
1020 16.6 2 para 8 1/4 Para	100	45	46	7
982				
982 C. 1st Para 4 1/2 Para - H. 1/2	318	91	20	26
981				
981 - def 1st Para 1 1/2 Para 7 1/2 Para	303	84.7	4	27
1016 901 1st Para 1st Para 1st Para	282	86	9	30
1018 16.6 1 Para 8 Para 7.8 5/4	280	72	31	40
Para	285	75	26	33
1019 16.6 1 Para 7.6 5/4 2 Para	306	71	54	27
1024 3 1/2 Para - Phosphoryl 1st Para	100	44	23	33
1025 - 1st Para 2 Para 4 Para 1 Para	100	52	35	13
1022 1/2 Para 1st Para 2 Para 1 1/2 Para	340	84	9	43
1021 Alpha Naphtol	314	59	93	34
1020 16.6 8 1/4 Para 2 Para	350	59	82	60

[ITEMS(S) FOUND IN BOOK]



Notebook Series -- Notebooks by Edison
Notebook, N-14-10-10.1

This notebook, which is a continuation of N-14-12-03, contains dated entries from October 1914. All entries are by Edison and pertain to experiments aimed at the rejuvenation or "regeneration" of used storage batteries. Included are the results of tests performed on cells constructed with various regenerated or experimental negative electrode "pockets." There are entries relating to pockets reconstructed with treated iron or formed using different crimping dies, as well as other pockets containing cobalt, cadmium, or small amounts of mercury. Many of the experiments bear the numbers 333E-424E, but not all numbers in the sequence are represented (some missing experiment numbers are detailed in N-12-02-00). Some of the cells produced in these experiments were apparently transferred to the Edison Storage Battery Co. at Silver Lake for continued testing. Their subsequent performance is tabulated in N-14-12-14.2 (see Notebooks by Edison and Other Experimenters -- Storage Battery). Inserted into the book is a report by John V. Miller summarizing the electrical capacity and loading weights of the nickel hydrate and the iron mix manufactured for Edison storage batteries between March 1911 and October 1914. The front cover is labeled "Regeneration No 3." The pages are unnumbered. Approximately 35 pages have been used.

Oct 10/14

Notes carried forward from No 2
book -

I think old wires from 4 year cells
if soaked 10 hours in 3% S-N
sulphurous acid care being taken
to dry quickly by vac to prevent
oxidation, pieces to be used just
as they are recovered from the
cell, + after drying ~~in vac~~

When all are dry should be
powdered to pass through
130 to 150 mesh screen
w/ with old die & extruding
8 grams given 1650 to 1750 rpm
if 15 grams old + 2 grams new
die mixed & used get 1750 -
probably if Edge crimp die
used get 2000 -

Oct 10/14

An old crumpled packet with 7 gram
of iron mix containing 20% of black
Stannous Oxide gives Very high

Capacity	1st Run	3130
	10 "	3260
	49 "	3679

At 35° deg Fahr only gives 300 to 350
so its not conduct -

Stannous Oxide alone gives considerable
Capacity see book 2

4 packets 8 gram Fe made suggested
A gave on 42nd Run Best test 1113
on 150 rate gave 371

2 packets 8 gram Fe made in
B 4 die gave 2403
at 150 rate gave 1581

Both A+B were run together

from the many tests we will
adopt #4 die, no pressure
on center of Cup, only Edges

Ferroceramumous self plate iron
gave no advantage over reg $\frac{1}{2}$

Bismuth with 2 $\frac{1}{2}$ to each nickel
plate after receiving 190 lines
at no time shows up as good as
Reg Cells to A4 type -
It has the peculiarity that it
gives same or even better exposure
at 130° fahr as at 75°

Submarine type plate #4 dies
B4 packet which is thicker than used
in practice in Sec 6 May ✓
Gives at Normal 96.5 107
at High rate 68 101

70°
96.5 / 600 70
635
-41.5

333E #404 die shows 1st 3 runs goes down after that every time after 750 rate off diesel the normal cap improves and the 750 rate is higher on 44th run face cut away this gave highest but 2 runs after showed no improvement Don't think cutting off face will be of much Commence and advantage
Average last Normal run 45 2728
92.6% of normal 750 rate 2256

334E 1st pressed with old Conwax die
then Crimped with #84 4 die
Average 2.774
Normal on 51 run 2190
at 750 rate 1810

335 E Gimp #014 die then pressed
with flat die

Average last normal rate	2895
7 1/2 rate	2079

336E #4 die, then Corrugated in reg Cor
die
Average last normal 2689
750 rate 62% 1687

$$\begin{array}{r} 2689 \overline{) 16870} \\ \underline{16134} \\ 7360 \end{array}$$

$$\begin{array}{r}
 2794 \\
 2795 \\
 2796 \\
 2797 \\
 2798 \\
 2799 \\
 2800 \\
 2801 \\
 2802 \\
 2803 \\
 2804 \\
 2805 \\
 2806 \\
 2807 \\
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 2876 \\
 2877 \\
 2878 \\
 2879 \\
 2880 \\
 2881 \\
 2882 \\
 2883 \\
 2884 \\
 2885 \\
 2886 \\
 2887 \\
 2888 \\
 2889 \\
 2890 \\
 2891 \\
 2892 \\
 2893 \\
 2894 \\
 2895 \\
 2896 \\
 2897 \\
 2898 \\
 2899 \\
 2900
 \end{array}$$

A4 with 20% Two Elements OK in f.e

V	$\frac{1}{2}$	
192	197	normal
122	201	100 amp rate
159	162	130 Fahr

A4 cell 359 - check to #4 die cells 33rd run
198 211

360 196.5 208

361 - 7 amper 200.5 213.5

Tried forming cells using #4 die

by 5.1st runs at 130° Bad
5 " " 35° Bad
5 " " Very high rate good

find out if it was chg or dischg
rate or both, S S S
1 1 1

385E

Cold test.

2 Reg short tube cells Reg Sol
but 4 grms each cell of KCl
35° Fahr

14 1520 2533

Nq - after a lot
runs went
to 20

386E 2 Reg short tube cells - Reg Sol
but 4 grms NaCl - (a) test
35° Fahr

14 720 400

Nq

387 2 short time cells. Reg 922
 21K2Li - 4 gram LiCl. Caldest
 35° Fahr

14	1467	887
----	------	-----

NG -
 Went to 20
 after ~~10~~
 20 Run

388 Same as 385 but 4 gram KBr
 35° Fahr

14	1880	2080
----	------	------

Went to
 20 gals
 20 Run

389 E Deep 385 feet 4 grms NaBr
35° Fahr

14	1733	860
----	------	-----

na

390 E Deep 385 feet 4 grms Na sulphate
35° Fahr

14	233	1867
----	-----	------

na

391 Dug 385 feet 4 grams K Sulphate
350 Fahr

14 0

147

MA

392 Dug 385 feet 4 grams Nitrate Na
350 Fahr

14 287

2000

MA

393 Dep 385 bedwell 4 qrs
Nitrate K - 3⁺

ACC from 385 to 393 to run 3
times & then go on cold test -
350 Fahr

14	220	220
----	-----	-----

nd

400 F

Packets loaded with Cobalt reduced from
 7 grams Cold by
 35° Fahr no to

8	745	900
29	800	945
30	840	1000
32	770	965
36	800-950	1020-1147
44	765-900	1040-1140

One of about 100 to
 125 def 6.25 V + 1/2 V

401

35° Fahr

8	500	460
29	540	475
32	485-495	420-430
36	505-720	415-530
44	495-660	400-530

Packets loaded with
 1/2 Cobalt 1/2 Iron
 7 gram pkts

250 def bet V 4 1/2

402 E 2 Reg B 4
 formed recg 5 runs, Sol
 emptied out 2 5/8 No. 10
 11 gms. 1.566 liters per unit
 Run Reg

1	103	102.5
2	102.5	101
3	97.7	97.5
4	95	94.5
5	96.2 ^{1/2}	95 ^{1/2}
6	96.2 ¹⁰¹	95 ¹⁰²
19	57.78.108	

changed Sol

~~1/2 to 1/2~~

All Cobalt reduced by H₂
Gives a number & get second

Its but little affected by Cobalt
see Cap to V & 1/2 V & 1/9 Valt,
also chg & chg curve to
get Economy - all the various
Expts put up some for life -
Single little cells & ~~2~~ ~~1/2~~ -
Middle's Experiment

B 2 or B 4 or A 4 -
Also see if the Cobalt (ind) Hg in

403E Cold test 35° Fahr.
 Cadmium reduced by H₂, 5 grains
 from number - 9 grains
 It's not so good as Pb salt, but
 better than Fe - 35° Fahr.

	403E			
16	347	353	247	167
19	307-1150	407-547	253-455	200-325
23	327-545	540-427	133-247	180-260
31	307-360	660-767		

404 - Cadmus 9 gms 5 grandies -
115 alms 4 1/2 #19 5 Rms normal
temp then 3/5° day

31

227-287

133-253

Cold level

406 E Cobalt by H. in Fe pocket.
Then 30 mesh No 449 for cold level

8

767

767

407 E Cobalt 64 H. Hous 30 mesh
4 1/2 Hg

8	533	607
---	-----	-----

408 Cobalt by Hydrogen 10% H₂O
How 30 mg/L

8	540	527	
---	-----	-----	--

409 Cobalt by H - then 100 need
No 49

8 653

707

410 E Coast by H. New 1000000
4% 49

8

527

547

✓
412 Cobalt by H, then 180 mesh
no H₂

8	673	593	
---	-----	-----	--

413 Cobalt 64 H, three 180 mesh
4% Hg

$$8 \mid 533 \quad \mid 533 \mid$$

414 Cobalt 60, 1000 150 used
10% 10g

8	520	400
---	-----	-----

✓
415-Cobalt. YVM# 2208 B1 -
Reduced at 1100 deg Oxidation
Cobalt Screened thru 30 mesh no Hg

5	387	400	High rate.
---	-----	-----	------------

416 Nil

417E @ 6600 g/m # 2208. reduced
11.20 deg - oxide made from COSO₄
4% H₂O then 30 mesh

5	250	250	high rate
---	-----	-----	-----------

1418 mil

419 E Cobalt - VM # 2208 D, reduced
bapt 900 degrees, oxide from CO504
from 30 mesh - No Hg

5 | 475 | 475 | Hughes Co

5-	225-	237	High note
----	------	-----	-----------

5-	225-	237	High note
----	------	-----	-----------

421 Cobalt-grim # 2211A - Self heated
ground thru 30 mesh No Hg

1	1653	1680	
2	1467	1520	
3	1387	1387	
4	737	737	High rate
5	725	725	"

422 Cobalt spray 2211 B -

40% Hg

5	475	400	Highmate
---	-----	-----	----------

423 Cobalt-girm # 2211C - self
heated - then 30 mesh
10% Hg

5-	325	325	Hydronate
----	-----	-----	-----------

424 gvm \pm 22126 Cobact
reduced at 1100 5/8 the previous
30 inch

[ITEMS(S) FOUND IN BOOK]

EDISON CHEMICAL WORKS

THOMAS A. EDISON, President
H. A. RAGLIDAN, Vice-President & Gen'l. Mgr.
H. B. MILLER, Treasurer
W. H. HENNINGSHOLM, Secretary
J. V. MILLER, Manager

Telephone (4122) BRIDGE ROAD
Telephone (4127) BRIDGE ROAD
Telephone Address, Via Newark, N. J.
BRIDGE ROAD, BRIDGE PLAZA, BRIDGE PLAZA, N. J.

SILVER LAKE, N. J. Nov. 24th/14.

Mr. Thomas A. Edison,
Edison Laboratory,
Orange, N. J.

Dear Mr. Edison:-

Enclosed herewith we send you two blueprints:-

- (1)- Comparison of Electrical Tests of Nickel Hydrate,
- (2)- Comparison of Electrical Tests of Iron Mix.

We have made these tabulations of the electrical capacity and loading weights of both Nickel Hydrate and Iron Mix for the past three years, and propose to submit you this table from time to time brought up to date, in order that you may have before you the quality of Nickel and Iron which we are making.

We attempted to make these on paper showing brown figures and lines, in place of this regular blueprint paper, but it does not seem to be very practical, and therefore, we are submitting these blueprints, and trust same will be satisfactory to you.

Yours sincerely,

EDISON CHEMICAL WORKS,

J. Miller Mgr.

JVM/JOR.

2-enc.

[ITEMS(S) FOUND IN BOOK]

C O M P A R I S O N S

LOADING WEIGHTS

ELECTRICAL CAPACITY

IRON MIX

NICKEL HYDRATE

[ITEMS(S) FOUND IN BOOK]

COMPARISON of ELECTRICAL TESTS of NICKEL HYDRATE (16th RUN)

1911-1912			1912-1913			1913-1914			1914-1915		
MONTH	LT.	ELEC.	MONTH	LT.	ELEC.	MONTH	LT.	ELEC.	MONTH	LT.	ELEC.
1911			1912			1913			1914		
APRIL	2 26.15	12.81	APRIL	2 28.95	12.80	APRIL	2 27.33	12.64	APRIL	2 26.85	12.60
	2 27.42	12.50		2 29.54	12.51		2 28.01	12.61		2 27.84	12.69
	2 25.55	12.50		2 27.22	12.50		2 26.19	12.61		2 26.14	12.73
MAY	2 26.53	12.50	MAY	2 27.94	12.60	MAY	2 28.18	12.52	MAY	2 27.12	12.62
	2 25.82	12.50		2 26.99	12.57		2 27.52	12.57		2 26.10	12.58
	2 26.03	12.67		2 26.54	12.50		2 26.81	12.67		2 26.10	12.58
JUNE	2 27.72	12.53	JUNE	2 28.44	12.63	JUNE	2 27.49	12.61	JUNE	2 26.87	12.52
	2 26.11	12.53		2 27.55	12.57		2 27.82	12.57		2 26.17	12.59
	2 27.32	12.53		2 27.08	12.53		2 27.76	12.59		2 26.10	12.58
	2 26.06	12.60		2 25.98	12.53		2 27.22	12.57		2 26.17	12.52
JULY	2 28.15	12.57	JULY	2 28.97	12.59	JULY	2 27.82	12.63	JULY	2 27.83	12.67
	2 27.31	12.57		2 27.59	12.57		2 27.60	12.63		2 27.53	12.62
	2 28.05	12.57		2 28.01	12.57		2 26.51	12.59		2 27.10	12.60
AUG.	2 26.21	12.57	AUG.	2 26.17	12.57	AUG.	2 26.17	12.56	AUG.	2 26.17	12.55
	2 27.19	12.59		2 25.92	12.57		2 26.17	12.57		2 26.17	12.55
	2 26.56	12.57		2 26.11	12.57		2 26.17	12.57		2 26.17	12.55
SEPT.	2 26.60	12.50	SEPT.	2 26.61	12.57	SEPT.	2 26.17	12.57	SEPT.	2 26.17	12.55
	2 26.10	12.50		2 26.17	12.57		2 26.17	12.57		2 26.17	12.55
	2 26.10	12.50		2 26.17	12.57		2 26.17	12.57		2 26.17	12.55
OCT.	2 26.17	12.57	OCT.	2 26.17	12.57	OCT.	2 26.17	12.57	OCT.	2 26.17	12.55
	2 26.17	12.57		2 26.17	12.57		2 26.17	12.57		2 26.17	12.55
	2 26.17	12.57		2 26.17	12.57		2 26.17	12.57		2 26.17	12.55
NOV.	2 26.17	12.57	NOV.	2 26.17	12.57	NOV.	2 26.17	12.57	NOV.	2 26.17	12.55
	2 26.17	12.57		2 26.17	12.57		2 26.17	12.57		2 26.17	12.55
	2 26.17	12.57		2 26.17	12.57		2 26.17	12.57		2 26.17	12.55
DEC.	2 26.17	12.57	DEC.	2 26.17	12.57	DEC.	2 26.17	12.57	DEC.	2 26.17	12.55
	2 26.17	12.57		2 26.17	12.57		2 26.17	12.57		2 26.17	12.55
	2 26.17	12.57		2 26.17	12.57		2 26.17	12.57		2 26.17	12.55
JAN.	2 26.17	12.57	JAN.	2 26.17	12.57	JAN.	2 26.17	12.57	JAN.	2 26.17	12.55
	2 26.17	12.57		2 26.17	12.57		2 26.17	12.57		2 26.17	12.55
	2 26.17	12.57		2 26.17	12.57		2 26.17	12.57		2 26.17	12.55
FEB.	2 26.17	12.57	FEB.	2 26.17	12.57	FEB.	2 26.17	12.57	FEB.	2 26.17	12.55
	2 26.17	12.57		2 26.17	12.57		2 26.17	12.57		2 26.17	12.55
	2 26.17	12.57		2 26.17	12.57		2 26.17	12.57		2 26.17	12.55
	2 26.17	12.57		2 26.17	12.57		2 26.17	12.57		2 26.17	12.55

COMPARISON of ELECTRICAL TESTS of IRON MIX (6th Run)

1 - FIRST BATCH MADE
2 - MIDDLE - - - - -
3 - LAST - - - - -

1. FIRST BATCH ABOVE
2. 1.0000 - " "
3. 1.0000 - " "

AVERAGE LOADING WEIGHT & ELECTRICAL
CAPACITY OF IRON-ASBESTOS, ELECTRICAL TEST
IN WHICH WAS FINISHED DURING THE WEEK

VERAGE LOADING WEIGHT & ELECTRICAL
VELOCITY OF IRON MIXES, ELECTRICAL TEST
WHICH WAS FINISHED DURING THE WEEK

Notebook Series -- Notebooks by Edison
Notebook, N-12-02-00

This undated notebook was probably used by Edison in October 1914. Some of the entries are continuations of experiments in N-14-12-03. Others overlap with work in N-14-10-10.1 or fill in missing experiment numbers from that book. The notes pertain to experiments aimed at the rejuvenation or "regeneration" of used storage batteries. Included are the results of tests performed on cells constructed with various regenerated components. Some entries involve the use of regenerated negative electrode "pockets," while others relate to regenerated positive electrode "tubes." The experiments bear numbers from 231 to 403, but not all numbers in the sequence are represented and the entries are not always recorded in numerical order. The front cover is labeled "Data Cell Regeneration Cadmium etc. Important." The front flyleaf is inscribed "Regeneration #3," indicating a connection to N-14-10-10.1. The pages are unnumbered. Approximately 55 pages have been used.

Acme Co.

MFG. STATIONERS,
96 JOHN ST.
AND
19 PLATT ST.
NEW YORK.

Registration #3

2 A4 Cells - green soaked Conc ColPhot,
dried then Koff, then loaded in tubos.

Its Capacity - cold 35° normal, high rate
dischg or hot no better in fact worse
than Regulars - See Book #2

Bad irons if iron taken out + powdered
thru 150 mesh + put in new packets
is nearly as good as new iron, if
 $\frac{1}{4}$ of new iron is mixed with it is
practically good as new, But
iron test should say it was
best to remove from packets
break up to $\frac{1}{4}$ mesh, soak all
night in 3% SO_2 acid, wash
out dry + then powder thru
150 mesh, add $\frac{1}{4}$ part of
new iron + use it will be
OK

of
Ferrous Ammonia Sulphate Iron
is no better than Reg iron either
at normal or cold test.

20% Stainless OX mixed with Reg
 Fe with 6% Hg gives very high
 Capacity normal - Very poor on Cold
 35° Fahr gives for 5 grms of
 H₂ (4 grms) 3200 MAH -
 7 grms 3900 MAH - Single tubes
 Don't think any gain in using it.

Tin itself used as place of Fe
 Tin reduced by H 5 grm cakes
 give

1	65
2	250
3	730
4	1050
5	1165
6	630
7	275
8	645
9	140
10	920
11	255
12	60
13	155
14	20
15	70

Curious -
 Needs expmty

333X

72 - Single 72 plate
 pulled in die like
 art #4

47	30.67	30.81
52	30.38	31.24

334X

Single ^Qz plate passed 1st with
Cohesion die, then Btl #4

47	2625	2863
51	2625	2813

335X

single non plants B
 pressed 1st with still #4
 then flat disc

47	30.43	30.62
52	30.69	30.77

336 X

Single B nonplate press
1st & 2nd #4 then reg Compacting
disc

47	30.75	30.09
52	31.13	30.64

333

pressed ott # 4 Edges only

116	2627	2600
122	2050	2050

At high rate

334

Pruned now with all
Cones & first; then compared
with Ott # 4

116

122

2727

1887

2487

1787

at high rate

335

Pressed with Ott 4 first then
with first die

93

2567

2507

336

8 gms pressed oil 4 then
Compared in oil reg die -

93

2747

2687

Special Ott 2 Die

" 4 Die

Reg Ott 2

" " 4

Spl 2

" 4

Reg 2

" 4

349

Ferraro Ave Sect 7a -

			800 mil amp discharge
87	1226	1666	
"	1666	1306	"
"	1706	1696	"
"	1320	1454	"
92	1146	1650	"
"	1786	1306	"
"	1826	1906	"
"	1426	1454	"

Oct 4 due 723011 mif 2109

353

	1V	1/2	1V	1/2
67	212.5	224	211.5	220.7
73	213	224	209.5	220

354

Max 2109 Fr 3011 -
Reg Corrugly die - a
check on 353

	1V	1/2V	1V	1/2V
67	211.5	221.7	210	221
73	211	222.5	208.5	222

352

Subman type plate 5114 - these 2 cells
are 13.4 - Cells will get more precise than it
should be present thicker than any Subst
type die who made
from

	1 V	$\frac{1}{2} V$	1 V	$\frac{1}{2} V$
59	101.2	108.7	101	110
64	101.7	109.2	101.7	109.7

355

2-134 #4 Old die - Edge Crimp

	1V	$\frac{1}{2}$ V	1V	$\frac{1}{2}$ V
59	102	109.7	102	109.5
64	104.2	111.2	104.5	111.5

358

20% Tin Ox 6% Hg - Cell # 89mm

	1V	.9V	$\frac{1}{2}V$	1V	.9V	$\frac{1}{2}V$	
68	63.2	171.7	210.1	58.2	171.7	213.2	High rate
74	76	164.2	207.2	66.7	163.2	211.7	"

359

Reg plate vs 9 pressed A4 cells +
 Corrugated 8 mm for comparison with
 360 + 361 E

	1V	1/2V	1V	1/2V
67	197.5	216.5	195	214
71	200.2	218.5	197.7	213.2

360

A4 - present in Oct 4 - 89

	1V	1/2V	1V	1/2V
67	195	211	197	214.5
71	197	212	200.2	216

361

4 neg plates - 7 gms -
pressed in oil 4

67	195	216	199	218
71	200	217	200.5	219.2

3 ways of forming

365

Same as 362 E. Cut off, but
formed at 800 rates & run
normal

53	2560	2420	normal-
59	1837	1875	High rate

366E_A

	1V	1/2	1V	1/2	1V	1/2	1V	1/2	1V	1/2
49	199	212	198	213	197.5	219	197.2	211		
53	200.7	213.5	201	213.7	200.2	219.7	200	214.2		

B

C

D

E

7

	1V	1/2	1V	1/2
198.5	211	199	211.5	
198.2	209.2	200.5	213	

6 AY cells - 7 samples pressed
 160 Tons new oil # 49 after 120 Tons
 pressed with plant disc 120 Tons
 Cells reversed to dist. tank L.O.H.

	361K		B		C		D	
	1V	1/2	1V	1/2	1V	1/2	1V	1/2
4L	102.2	114	104.2	116	103.7	116.5	107.7	125.5
47	108	116.2	107.5	116	107.5	116	111.7	121

E		F	
1V	1/2	1V	1/2
100.5	108.5	99.7	107.7
102.7	111.7	100.5	112

13.4° - 5.3 grms H₂
 Oil 4 80 Tons
 Normal Temp
 CD - " 130 Fahr
 EF " 35° deg Fahr

378

79m pit 300 alms
Checker die

48	2027	2227	Normal
54	1225	1387	High rate

379

7 gm Pkt 200 atoms

48	2567	2453	Normal
54	1725	1662	High rate

380

7 gm pkt
125 atmos —

48	2520	2380	Normal
54	1787	1500	High rate

240 Cobalt Cells-

120 Tubes

	1U	.9Y	1U	.9Y
120	189.5	199.7	187.5	199.7
125	194.7	207.5	192.7	203.5

Bramuth 351E

221	18	.9V
226	197.5	201.7
	201.7	205

371 B4-Bismuth Cells (H2O) (m)

53	1V	.9V	1V	.9V	1V	.9V
87.5	92.2	81	83.8	86.2	89.5	
88	91.7	93	82.5	85	87	91

372

Red green soaked Conc KCP
+ dried + left in pores to break up
green

46

52

1217

1217

1257

1266

373

Green soaked KClO₃
left in46
521343
13331290
1290

374

fresh soaked K Nitrate
left in

46	1323	1220
52	1323	1223

375-

Green soaked K Sulfate +
left in -

46	1300	1183
52	1303	1197

376

Green soaked K Bromide
left in -

46	1297	1307
52	1297	1307

377

green soaked K Carbonate
left in

46	1273	1283
52	1273	1280

7 gram packet
 For Amion Sul Fe 20% Diammonox

344

20% SnO - 6% Hg 7 grams
 Ferrum Nit 504 Fe -
 Half Capacity

66	2675	2560	2075	2100	Just had 10 hot runs
67	2910	3000			
75	395	2560			

385

386

387

388

1	2533	2367	2433	2487	2220	2333	2153	2367
2	2047	1980	1873	2033	1840	1933	1767	1707
4	947	1000	947	1007	787	1547	900	913
5	1107	1160	1047	1060	887	1340	1080	1060

389

390

391

392

over

2440	2447	2453	2507	2453	2213	2460	2460
2073	2033	2047	2073	1693	1787	2060	2060
953	1533	27	687	713	807	920	860
1247	1313	167	1180	340	1053	1067	920

350746

393

1	2460	2460
2	2053	2073
4	920	1047
5	920	1187

35° Fahr

" "

750 ma per pocket,

3 run normal
 10 " at high rate
 20 " "
 30 " "
 40 " "
 50 " "

Reg Cells

Burn ground from ribbons
 of iron pockets

	1V	1/2	1V	1/2	1V	1/2	1V	1/2	stand
14	195	207	195	208	195	207.5	192	205.5	
24	162	208	160	205	160	205	160	202	
34	168	219	170	218	171.5	216.5	170	211.5	
44	170	218	165	215	170	213	165	210	
54	170	219	168.5	217	175	215	170	213	
64	168	218.5	170	218	175	211	164	208	

381 Regular
to Compare

66	170	17	217	170	213
----	-----	----	-----	-----	-----

381X Burroughs

66	1735	213	170	2075
----	------	-----	-----	------

231

Run

225

1083

1077

368

Short lead Sealed 24 hours
Conc. L.O.R. then put in 21 K 24
4 ft right on chg - 72 pressure

72

1307

1323

400

1
2

525
650

650
760

401

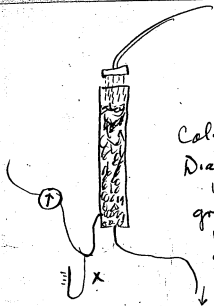
1	1335	1290
2	835	835

402E Cadmium No Mercury
Reduced by H₂ from Oxide - To
German as an from 35 Fahr

403. Continued by H. for 0.5
4% H₂O - Run 35° Fahr

Notebook Series -- Notebooks by Edison
Notebook, N-15-00-00.1

This undated notebook was probably used in late 1914 or in early 1915. All of the entries are by Edison and pertain to the absorption of benzol gas. Included are experiments with various absorbing towers, different arrangements for passing water through the apparatus, varying amounts of gravel in the towers, and different amounts of pressure on the gas entering the towers. The front cover is labeled "Benzol Absorbing Expmts." The pages are unnumbered. Approximately 20 pages have been used.



Column $43\frac{5}{8}$ long
 Dia 6"
 weight 64 lbs.
 growth 7" of $1\frac{1}{2}$ inch
 10" of 1 inch
 gravel below
 $\frac{1}{2}$ inch gravel

No water passing —

With 1 inch water Column of
 gas pressure 31 ft gas passed
 per minute with 4 inch
 water Column x pressure 61 ft
 gas passed — with 7"
 80 ft passed —

$$49 \quad \frac{14 \frac{1}{2}}{36} \div \frac{5 \frac{1}{2}}{72} \div 200$$

$$\frac{585}{1170} \div \frac{64}{35} \div \frac{128000}{105} \div 336 \text{ per ft}$$

$$\frac{4}{29} \div \frac{117}{29} \div \frac{64 \frac{1}{2}}{38} \div \frac{3360}{222} \div \frac{1400}{4200}$$

30 gals

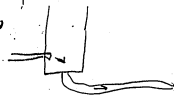
3 gal min

1400
4200

We passed water thru
Colum gently got 585 cc
per minute.

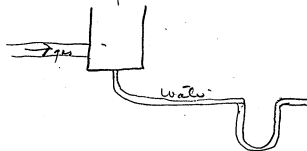
With 7 ft absorbing tower
this gives 200 times more
of 117 litres per minute.

We passed gas 39 ft min
One inch water pressure
& measured water passing
thru to see if less water
or any interference
it was 670. This is wrong
as gas escapes thru water
overflow



$$\begin{array}{r}
 117 \text{ tubes} \\
 1400 \\
 46800 \\
 \hline
 117 \\
 163200 \\
 \hline
 40950
 \end{array}$$

We now put in a U



So gas can't go thru water
it must go up column

We read water passed per min
again, 675 cc water 680

Apparently the gas helps the
water to flow or the water
feed is working faster than at
first -

Gas with $1\frac{1}{8}\%$ water column
38 pressure gives 38 cubic ft
in 1 minute -

1.8/gal per ton coal

With water running 675cc
We put gas at $\frac{1}{4}$ " water column
at passes 17 cubic ft.
 $\frac{1}{2}$ " gives 25.5 "

$\frac{3}{4}$ - 32 "

1" 37 "

$1\frac{1}{4}$ 42 "

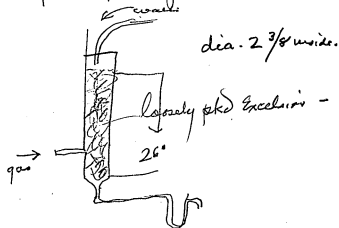
$1\frac{1}{2}$ 45.5 "

$1\frac{3}{4}$ - 49.5

2" 54.5

3" 66"

Wet put up a glass column



Water passed in 1 min -
950 cc -
gas pressure 3" -

at 3" water column pressure 66
66 Cubic ft per min -

at	2" —	58 Cubic ft
at	1"	40 "
	$\frac{1}{2}$	25.25 "
	$\frac{1}{4}$	15 $\frac{1}{4}$ "

24 Cent is 75 Fahr
20 Cent is 68 Fahr

		Gravel	Speed
Fig	3	66	66
	2	54.5	58
	1	37	48
	$\frac{1}{2}$	25.5	25.25
	$\frac{1}{4}$	17	15.4

We now fill the $2\frac{3}{4}$ glass
tube $\frac{1}{2}$ full of $\frac{1}{2}$ inch
gravel pass 150 cc water
per min -

150 cc - water passing

Gas pressure	$\frac{1}{4}$ " water column	17.5" A.C.F.
	$\frac{1}{2}$ "	26 "
	$\frac{3}{4}$ "	31 $\frac{1}{2}$
	1"	37 $\frac{1}{2}$
	1 $\frac{1}{2}$ "	46 $\frac{1}{2}$
	2"	54
	$\frac{2}{3}$ "	65.75

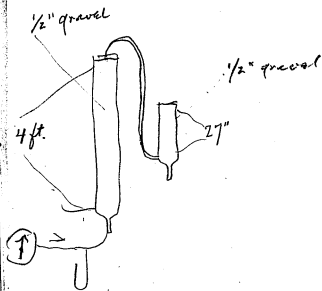
Doubled amount of
gravel

3 inch ³ Water Column			64 $\frac{1}{2}$
2 "	"	"	54
1 $\frac{1}{2}$ "	"	"	45
1 " "	"	"	36
3/4			30
1/2			23 $\frac{1}{2}$
1/4			15

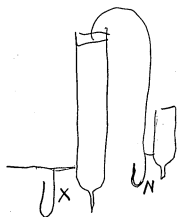
Height gravel 27
1/2 141-

$$\begin{array}{r} 27 \\ 12 \overline{) 324} \\ \underline{24} \\ 80 \\ \underline{80} \\ 0 \end{array}$$

$$\begin{array}{r} 27 \\ 12 \overline{) 324} \\ \underline{24} \\ 80 \\ \underline{80} \\ 0 \end{array}$$



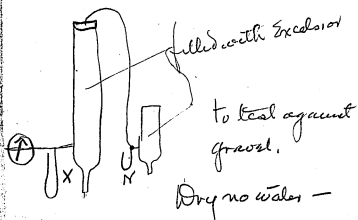
$\frac{1}{4}$ water column -	$9\frac{1}{2}$ cubic ft
$\frac{1}{2}$ "	17.3 "
$\frac{3}{4}$ -	23
1 "	27.2
$1\frac{1}{2}$ "	34.5 -
2 "	42
3 "	52



Two water column gauges
X & N -

When X is 3" pressure N is $\frac{3}{4}$ "
 2 " " $\frac{1}{2}$ "
 1 " " $\frac{1}{4}$ "

Took off N opened up pressure on X
 was $2\frac{1}{4}$ inch



$$3 \text{ in } X \text{ N } \frac{1}{16} -$$

Cub. ft. in. 48

$$2 \text{ in } X = N \frac{1}{2} -$$

" 37.5

$$1 \frac{1}{2} X = N \frac{5}{16} -$$

32

$$1 - X = N \frac{1}{4}$$

25 $\frac{1}{4}$

$$\frac{3}{4} X = N \frac{3}{16} -$$

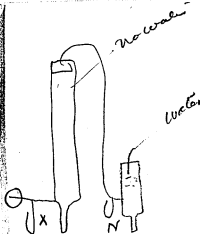
21 $\frac{1}{4}$

$$\frac{1}{2} X = N \frac{1}{8}$$

16 $\frac{3}{4}$

$$\frac{1}{4} X = N \frac{3}{32} -$$

11 $\frac{1}{4}$



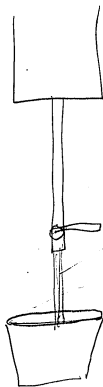
1" on X with water running
into small column gives @

3/16 pressure -

150 cc water passing per
minute - while X is 1"

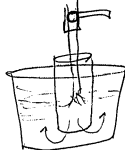
on the short column of
Exelsior using Amine
Violet, it fairly desultorily
shows preference for
glass sides but can
see it way in —

there are spots at glass
2" sq. nat wet think
when wet with water
or oil it will be fine
Even —



14 gals min is what we want, its
a pretty fierce stream & when it
strikes water in pool & swashes
so it would not rise & enter
grooves on distributing table

Very Even, its thrown into
water we now try



to see if Can stop waves

Notebook Series -- Notebooks by Edison
Notebook, N-15-03-04

This notebook contains one dated entry from March 1915. All entries are by Edison. At the beginning of the book are two pages of notes on phenol, toluol, aniline, and other organic products. The remaining entries pertain to the manufacture of kinetoscopes, disc and cylinder records, Bates numbering machines, and other items produced by the Edison Phonograph Works. Included are notes on machinery needed for factory buildings reconstructed after the fire of December 1914, along with plans regarding labor, output, and efficiency measures. Some of the entries deal with the trucking of parts and supplies to the various departments of the Edison Phonograph Works, while others relate to inspections, gauges, and other quality control measures. The pages are unnumbered. Approximately 25 pages have been used.

B Points
 Benzal 60
 Toluid 109
 Nitro Benzal 213
 " Toluidal 225
 Aniline 182
 Toluidine 196

In reducing with iron
 Copper the feelings slightly -
 This makes local action
 & hastens reduction

In practice 100 pts Nitro Benzal
 yields 100 pts Aniline

Kopp nitroates with Nitric
 Acid & Sulfuric -

"Aniline Oil" is a trade
 name for Anilin Toluidine
 & pseudo Toluidine -

Aniline pure does not make
 pyments to any extent

Rising in Germany has a synthetic
Carbolic plant. Whenever the
price of Carbolic goes beyond
14 cents he starts it. This
shows that it can be made
around 14 cents —

3/4/5

Kintoropas 30 week schedule

Wm Smith Oper

	OK	on	one	single					
Monday	186	30	0	0	0	Thursday	46		
Hours	131	32	0	0	2	Hours	84		
10	174	30	1	1	0	10	21		
	64	61	2	1	0		30		
	27	60	0	0	0		86		
Tuesday	34	30	1	1	0	Friday	141		
Hours	24					Hours	180		
9	27					10	176		
	21						62		
							41		
Wednesday	138					Saturday	39		
Hours	171					Hours	31		
10	68					5 1/2	27		
	30								

3

Slip given on next weeks schedule of Card the parts due

Correction for surplus made once month

Production 97 Discharge of
falls below 95% of Efficiency Eng - or
98% OK parts -
1 Cent hour spin of 97 1/2 2 Cents of 100%

Tapped hole gauge - & gauge
for screw that goes in Tapped
hole This includes even
Machine Screws -

Testing Machine for springs

One tool sharpener for
Each Dept if warranted
or 1 for 2 or more depts.
All Drills kept double set
~~set~~ & changed _____ \$
find this out -

High speed Cutting tools -
Bench gauges -

Bushing's gauged 2 or 3
times a work on Die
jig or Screw Tools -

Arrange all burrs taken off -
Use Schleierseape for hardened
work - test each piece -

The Dept Truckee goes with his truck
to the various Depts each day to get
his parts due his Dept unklar the
correct schedule & returns them to the
part in the various boxes for mfg in
his Dept, all other Depts do the same

He next gets the proper amount of
unmfg'd stock from the large & small
stock room -

In afternoon he distributes along
the mfg machines the stock for
the next day -

The men on mfg machines -
turn in parts in morning
made in previous afternoon &
in at 12 noon what they made
in forenoon - so all can be
inspected -

The parts turned in by the men
are to be entered on their
Card -

Machine Number	Capacity	Days	Discs per week supply	Hand	Days	Week
1	5000	1	4	1	3500	3/4 2
3	4000	1	4 1/2	1	2500	1 2
4	3500	1	3 1/2	1	1500	1 1/2 2
11	3000	1	3 1/2	1	800	3 2
7	2500	1	2	1	700	3 "
9	2000	1	2	1	300	7 "
3	1500	2	3	1	175	8 "
14	1000	2	2	1	200	10 "
3	800	3	2 1/4	1	55	23 "
4	700	3	2	1	70	29 "
4	600	4	2			
5	500	4	2			
2	400	5	2			
1	350	5 1/2	2			
2	300	7	2			
2	250	8	2			
1	200	10	2			
1	125	16	2			
1	120	16	2			

93 machines required -

Have 162 = But this is only for disc - which takes 21% of the capacity of the 93 machines
54 days employed 198 days unemployed

	part	Daily Schedule	Daily Total	Weeks	
No. of	104	160	16640	2	183000
Cylinders	68	80	5440	"	60000
Pis	329	32	10528	4	231000
Knives	416	5	2075	8	91000
			34683		

1 qurl Callipers 8 per min
4800 in 10 hours

Requires 3 qurls in Screw Mac
Dept

Disc - Screw Dept -

Gangway	4	girls
Supplies to other Depts	1	"
Card Index	1	"
Trucker for supplies	1	man
Bookkeeper and	1	man
Bookkeepers girl	1	girl
Buy Manager	1	man
Floor Stock boys	2	Boys
Travelling Inspectors	2	man
Tool Setters	4	"
Oil Chip & part Trucker	1	"
Oil & part separator	2	"
Officeway Eng'r	1	"
Chlor & Chloride	1	"
Tool sharpeners	1	"
Swimming	2	girls -
	<hr/>	
	26	

Screw mach - Where one
Machine makes many parts
The tool for all the parts this
Machine is to make is stored
in Clipboard handy to it -

Same in all other Dept
Some will be in locked boxes

Device Split screw guide
tube & holder for stock -

When say truck man from the
Dept comes for his parts for
200 phone Disc 80 Cy 30 big +
5 Kunits daily. He has several
boxes which go with the truck
+ trips with it.

These boxes are passed over the
country, an mass of parts are
brought to weigh machine by a scoup
+ weighed + parts left over in the
scoup returned to ~~the~~ boxes.

The Disc + Cy parts get every
day - 100g + Kunits one
twice week alternate days.

The boxes in each Dept has its
boxes so-bunched that those
going to another Dept are
placed together -

Disc	parts
Grinding	30
Punch	60
Blacksmith	40
Lathe	26
Gear	44
Plating	59
Japan	9
Born assembly	17
Grinding Castings	14
Sub Assembly	46
Screw	104
	<hr/> 449
	Operation
boxes	898-

Use the Two short Extension
buildings Bottom floor to
store tested Motors

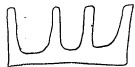
300 motors long 12 motors high 16" to
Motors 16 in Row 200 machines in
one rack

11 Rows of racks - 2 weeks output
requires 9 racks - if filled
entirely stores 2200 Disc
Motors

In addition there will be
300 in test racks in assembly
room & some in Cabinet
assembly building

The other short building to
store Cylinders Rectors TBiz
& Bales —

Board showing pieces of
stock used,



Hold

Screw stock on floor at
Carus house several days
supply

Assembly room -

Racks to hold 2 days output
+ kept running for Discs

Cylinders

18 1/2

Kineto

All kept running -

4 Booths With Cabinets to
test noise disc Mac

Cabinet wheeled in booth with Motor in

2 Booths for Cylinders

Same as Disc

Motor put in Cabinet passed in

Discs 4 Rows 50 ft Long 3

Motors high 37 machines in 11 shelf -

Total 444 machines

Always use same Cabinets

for Disc & Cy - for noise

test will require say 12

for disc -

Reis should get me time
on assembling Big Mac

Ditto Bates, Various Macs,

Stop purchasing daily of a
lot of little things - Codify
+ have a stock list of all

Req route Schedule things for
Disk-Cy Big Telescope Bats +
Kineto - 3
With Maximum + Minimum
+ when to order

Buy for yearly want at
best prices + only order
shipped when needed

Start board for sample each
kind stock used for the 5
machines - priced where
possible -

All Special Stuff Keep under
Special + never mix with
Schedule Stock -

Adapt Visual system in
Stock Rooms -

One extra man each dept
used for sub- + he should
be general all around man

Where man used a large
number jigs bunch them in
Cupboard near tools he uses

Take the Big Machine
say 100 parts must be
drilled on a schedule of
160 a week 30 parts daily

1600 parts wanted weekly
say each man averages 400
parts daily or 2200 per
week -

This would take about 7
men -

Each man would have
14 jigs, work 4 hours on
each jig per week

if schedule reduced to 140
Machine work then 6 men
working 17 jigs each would
do it

If schedule reduced to 117 then
5 men each with 20 jigs would do it
If reduced to 94 then 4 men would
do it each having 25 jigs

For each reduction of 23 machine
a week 1 man can be laid off
his jig divided among the others

Next page

Each man has placed near his tools 2 boxes. 1 has a week's supply of a certain part, the other box or $\frac{1}{2}$ of box is empty. he drills say to schedule the required number & they go in either $\frac{1}{2}$ of box - each box holds a week's work - If he is working 22 hrs, he does \$1.90 per day & each day the stock furnished goes to stock room -

This plan is to be adapted with Big Kinto

& Mechanist employees who can set their own jobs & only use a few drilling machines -

for larger production
1 man can be ordinary labor & don't set drills but only tends 3 or 4 jigs -

Man No 1 attends to 16 Drill Jigs
Jigs in Cupboard near his Drilling Machine
7 Drills used -

Monday 7 am finds near his
machines 20 boxes each divided
by a partition in the center

In one half are 165 parts.

He can do on an average say
500 parts, or 50 parts per hour
3.3 hours will finish the 165
parts & they are put as fast as
drilled in the other half of the box
He

He then gets another jig & either
changes the drills in machine he
was using or slips to another
machine that has the right drills
& in 3.3 hours he finishes the
2nd part,

The next 3.3 hours he finishes
the 3rd part & has made
his 10 hours, then morning he
turns these in to clock room

It goes on to the next parts 3 each day, until the 16 parts are made from all the jigs + these are enough for the weeks work - If

If there are 64 parts it will require 4 men
if 54 it will still require 4 men
if 67 it will require 5 men

Because its impossible to balance up - Except by increasing the schedule per week for machines + this is bad policy -

This unevenness will even up thru all the Septs

In the case where the output is considerable like the Disc + Cylinder the men only have a few jigs + the stock boxes are placed every day or every other day - in ~~cases~~

Where a man can

We shall have to have many
Double gauges to stop use of
Measuring tools which are
not handled accurately

Along the screw machines for
nutcases all the gauges (high low)

5179 should be at each machine
that that particular machine
makes parts for. The Inspector
as he comes along picks up
gauges ~~and~~ inspects the part
& puts gauge back & so on

Another Deep gauge is at
Shop room -

Another Deep for same
part is in the other Dept of factory
that receives this part to perform
other work on, if it still goes
to another dept to have work
done on it, this 3rd dept has a
gauge, sub assembly, but final
assembly have no gauge

We should Organize a Repair
part dept. + this Dept have a
supply of every kind old + new
of all part machinery we need
for which parts are called for
One man can attend to it +

Keep book in fact a Bookkeeper
can run it + he should be
given a small place to store his
stock. This dept should show
a good profit - This man
could pack his own stuff +
see that it is shipped
+ possibly the outside travelling
Repair men should be under him
One boy perhaps to assist this
man -

May have to do it,

When get assembling Table ready to
Assemble #30 in Cabinet teach new men
Taking apart & putting together, until their
time has got down fine, one of Luhrs men
to do this work a bright one, fine mechanic
who will do as an efficiency man after
we start,

Start table in top of Office where
nobody in a in Cabinet assembly
Cabinet building - 6 men.
Assembling & Taking apart #30
Motors till we can get two
or 3 good ones, pick best men
from gate,

Get Another Table & try 3 on
Big Mach,

Ditto - fix up Belt & table
top of office & take parts
for 20 or 30 Disc machines
+ Start necessary men to put
200

Extra men for assembling &
about men can be kept in
job shop & tool room & called
to factory any time this week
Keep all producing -

1000 -

1100 -

500
400

60000

400
300

600
400

150
70

Notebook Series -- Notebooks by Edison
Notebook, N-15-09-23

This notebook was used by Edison in September 1915. The entries pertain primarily to methods of obtaining additional phenol from "waste liquor," aurin, and other byproducts of chemical production. Included are experiments with carbonated solutions, benzol, and naphtha. Also included is one page of notes, entitled "Submarine," on the chemical absorption of hydrogen, which probably relates to the evolution of hydrogen gas by the Edison storage batteries used on submarines. The front cover is labeled "Phenol CO2 1915." The pages are unnumbered. Approximately 15 pages have been used.

CO₂ Expmt Sept 23 1915

Passed CO₂ from H₂SO₄
Limestone thru one gal
of Dally's Ammonia liquid
Reg filtered, took 9 cubic
feet

Separated Phenol by
funnel - There was
considerable white
floating stuff clinging
to bottom of floating
Phenol. Treated the
Phenol with 98%
H₂SO₄ diluted
1/2 acid & 1/2 water by
burr

There was considerable CO_2 given off so it will be necessary in practice on a large scale to add it gradually

The net Phenol was
310 cc giving 8.4 per
100 cc

This would give for 1962 gal
1340 lbs Crude, but not so
much if we consider the
bulk of the Sulphite filtered
out in addition there is
probably 25% water in
the Crude Phenol
only net 1072 whereas we

should get 1550 pure —
Treated 800 cc of waste
liquor with Bengal,
then treated Bengal
with 33% NaOH & neutralized
it & got 11 cc phenol
this brings total to
360 cc phenol on basis
1962 gals gives
1555 lbs phenol —
The question is now
How much water
has this phenol —

I tried solution again with Bengal
but very small amount
phenol came off less than
1 cc no doubt if agitated
more than 5 min. as we
do it in separating funnel we
would get it all —

I also took the waste
liquor from 1st benzal
neutralized it with
 $\frac{1}{2}$ + $\frac{1}{2}$ acid & got less
than a $\frac{1}{4}$ of an cc
in 200 cc

This shows if well agitated
in Bengal & this well
agitated with NaOH,
we get all the dissolved
phenol in the liquor

There is some doubt if
this 1st gal was fully
Carbonated —
2nd one is being made

On distilling only got
38 cc free good phenol
out of 50 cc

24% of water —

or 273 net,

or 1291 lbs per fusion —

259 lbs loss —

This loss is either in not carbonating
enough. Or fusion is at too low
a temperature,

4.7 lbs to gal Benzol.

In this distillation
there is a little of much
& considerable black

This phenol crude after
acid was quite dark
red.

The residue weighed
6 grains - was brittle
hard.

This seemed make about
80 cc - 5 of water 6 of
residue or 6 of phenol
11 cc of water & Residue -

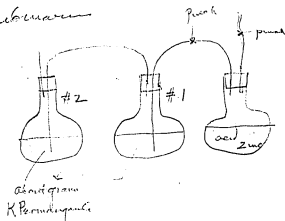
Much drawing phenol
wants stronger acid
treatment -

after treatment with $1/24 1/2$ in
H₂SO₄ - The evolution showed
some much

I then ~~also~~ drew off phenol
by separating funnel &
treated again with ~~25~~ $1/24 1/2$
H₂SO₄ - This threw out a
large quantity of precipitate
that made the whole of the
phenol very milky - I again
separated the phenol in
funnel & filtered it through
glass & leaves a white
sediment on the funnel
paper - only 5 cc water comes off 74 cc phenol
No much considerable drawn - pulled about 50%.

I then treated some of the
original Crude phenol
with HCl. This threw out
even more white stuff

Substance



#1 is yellowy white of Manganese oxide

#2 only a little,

It is a pretty good absorber
of Hydrogen

Impure Oxide Copper like MgO
by Cuscuta & some sublimation
substances

Mean H_2SO_4 - It does not appear
to want to settle out of the
phenol but may do so
= later 36 hours - white much gone phenol
clearer water also, where did it go??

Think after treatment of phenol
by strong acids that some acid
left in & this causes it in fact
should wash with a base
that is so weak phenol don't
combine with like Magnesium
oxide, Litharge =

Distilled some of the Arvin
from Dallas, 1st distillation of which he
got 1200 lbs - At least 33% is
phenol & can be got off by
using one of Reimer's
little pills treating with
 NaOH filtering & Neutralizing

What is left is puffed
stuff - may be valuable -
Will have trouble get it
out of the experiment

T
Note CC measure in
Ice chest,

Can't get phenol from it by
NaOH etc in regular way,
must be a compound
which is broken up in
distilling giving up its
phenol -

I separated the phenol ^{that was distilled off} + put it
in CC glass in Ice chest to
see if it will crystallize without
being distilled -

36 hours in ice chest didn't
crystallize - found lot of salt
at bottom of CC glass

The muck from big still
distilled in iron pot, 1st trial
got 123 cc liquid —

2nd with 1% Carbonate soda
foamed terribly only got 180 cc
liquid as it was mostly black
JBA suggestion is bad —
This muck was probably
thicker than 1st muck
Have sent for fresh lot,

Mason's Carbonating in glass
tubes, got 370 cc Crude phenol
removed 50 cc — this left

320 cc but there was 10 cc
mud at bottom so only
310 cc

Added 61 cc of $\frac{1}{2}\text{H}_2\text{SO}_4$ acid
this brought out 109 cc

of water in addition to the 6 cc
making 170 cc clear liquor
acid water
The phenol was then drawn off
& filtered - it amounted
to 11 cc by weight, fatter paper holds

Repacked 300 cc of the liquor
from which the Phenol was
removed from - this gave
2 cc or 25 cc per gallon
after $\frac{1}{2} + \frac{1}{2}$ weeks

306 cc per gal - 89% by
distilling is pure Phenol

272 CP Phenol
per gallon by Carbonating

Took 50 cc of 10% Cocaine solution,
liquor after Benzaldehyde a part
in Benzene - got,

Tribromophenol contains 28%
phenol -

The Tribromophenol weighed

1.22 grms - 28% gives

341 milligrams phenol -

There is 151400 50 cc lots in one
fusion - this gives 51627 grms
phenol or 113.7 lbs lost

After Benzoyling I neutralized
the alkaline liquor &
Benzoylated it again got no
phenol - not a trace,

Spent Carbonated liquor
after Crude Benzol taken off
Benzoylated with 2 of Alkali
& 1 Benzol & shook by foot
10 min. then Benzol treated
with 2 Alkali 2 li. gives no more
than my other experiment To wit
scant 2 cc phenol
Using 300 cc Alkaline liquor
neutralized with $\frac{1}{2}$ & $\frac{1}{2}$ It got
very hot,

Evidently Benzol only takes
out a little more than $\frac{1}{2}$
The phenol that is in an
alkaline liquor Carbonated
as previously shown by
Bromine test,

Must try other things than
Benzol -

$\frac{1}{5}$ ~~is~~ Benzol is apparently
as good as ~~300~~ $\frac{1}{3}$ of Benzol

Andrews test shows 4.5%
Sodium Chloride in our
Benzosulfonate of Soda

Solvent Naphta seems to
be as good as Benzol for
removing Phenol from
Waste liquor

300 cc Tube Concentrated
liquor gives 2 to 2.25 cc
phenol which is a shade
better than Benzol

$\frac{1}{2}$ & $\frac{1}{2}$ is liable to Brown
the solvent Naphta
also Soda takes out a

Something from Solvent
Naphta that $\frac{1}{2}$ & $\frac{1}{2}$ Browns

So if we use Solvent
Naphta it should be
well washed with
Soda —

Notebook Series -- Notebooks by Edison
Notebook, N-15-12-20.2

This notebook was used by Edison during the period December 1915-January 1916 for experiments pertaining to sound recording. Included are notes on the quality and loudness of recordings made with different numbered recorders, various arrangements of equipment and musicians in the recording studio, and different shapes of the recording chamber. One entry contains the notation, "we can control quality by chamber size to a great extent." The experimental recorders referred to in this notebook are described in earlier books by Absalom M. Kennedy, such as N-14-09-21. Many of them are evaluated by Edison and Kennedy in N-15-11-19, which also describes the outfit of the recording studio. Experiments involving the arrangement of the studio include changes in the location of musicians and instruments, the dampening of sound through various methods, the use of different instrumentation, and changes in the instruments. The locations of musicians in some recordings are indicated with reference to a numbered grid on the front flyleaf of the book. The front cover is marked "Edison." The pages are unnumbered. Approximately 70 pages have been used.

66769
Acme Co.,

MFG. STATIONERS,
96 JOHN ST.
AND
19 PLATT ST.
NEW YORK.

19	7	1	8	20
21	9	2	10	22
23	11	3	12	24
25	13	4	14	26
27	15	5	16	28
29	17	6	18	30

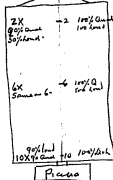
Piano

cowhairs
chamber
according

L. S. Brown
12/26/73

see notes 1002
N-15-10-21 also

Dec 20 1915



Lining at these
positions to determine
hardness & quality

Length of OH chamber — 12'
Height — 8'
Width — 9'

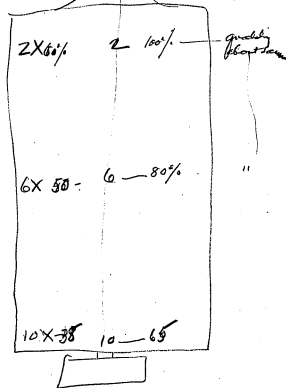
In this test #57 scratches
Considerable

Of the quality of concrete
10 ft is better than 6 & 6
better than 2 ft —
The % are only for
comparison between
middle & Sides —

#57 has changed over
 Sunday so it is
 now scratchy on
 tracking whereas
 previously it
 was smooth tracking
 Tried wearing white Record NG
 Closed CH chamber NG
 still scratchy —
 later - 57 ok on blowing clips too strong

#57 Recorder

Vial test



Quality about same
 on sides as in Center

Test on slot of Piano -

1 = 6" X 24" 100% quality 100

2 3 X 24 70% " 100

3 6 X 12 100 - " possibly 100

4 3 X 12 70 "

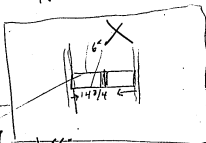
Slot like X -

Very little difference

think 3 X 6

Center is

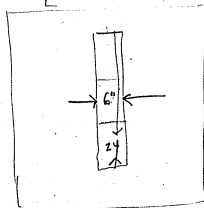
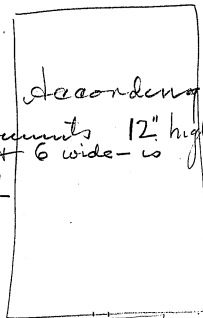
louder



also 14 3/4 long

12" wide piece of 6"
loudness about same but more mellow not
so sharp

According to
Experiments 12" high
4 6 wide - is
Best.

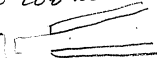


Experiment with blowing
tube for chips -

Put Cock in -

No air	100 -
$\frac{1}{4}$ turn of cock	100
$\frac{1}{2}$ "	100
$\frac{3}{4}$ "	175
all on -	300 -

This shows that aer
surface is largely due
to air on certain
occasions &
that we must regulate
it -



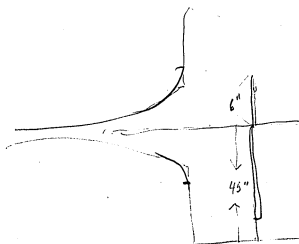
$\frac{1}{32}$ slot $\frac{1}{4}$ long

Am making it this



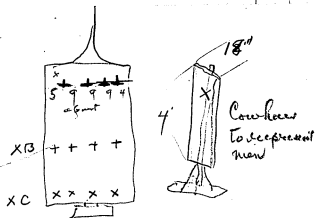
Do no sharp Edges -
& polished -

Its set $\frac{1}{4}$ from wax &
inch back from ball -
So Kennedy says



with Dummies $\frac{1}{2}$ way in
Chamber XB -
Valuum diminishes
from 100 to 60%

XC - 1 ft from end of chamber
& 1 dummy directly in front
of slot of Piano -
about 50% -

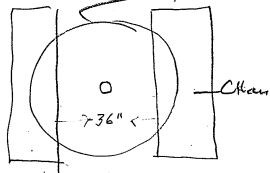


Playing Piano, with &
without,

With X there is not much
difference in Valuum of
Piano probably 100%
without X to 85%
with Dummies.

~~XC~~

Dec 21 1915



Piano only 60% loudness
as without, softer -

Overcoats wally - in 9x10
Hair Chamber 10ft F.
Made into Blue asbestos
Playing soft ear hear nothing
horn hear all good quality but
weak - Medium playing
Can hear faintly with

Ear, fairly loud with horn
played Very loud -

Can hear it plain with
ear about same as a
weak Condenser Record

This would be loud
Enough for a Record
if surface good -

Surface on Blue Amberol

Very good didn't gather
even with softest playing
a horn

Piano 10 ft away

6x36 ~~steaming~~ used
6x24 is louder

Notice as Piano gets Louder
Roll diminishes & defects
Commence to show
Note is surely too loud
yet in medium playing
its there but not so
conspicuous —

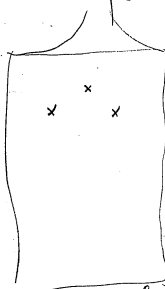
77 & 57 good
77 softer quality — Bunkie —
Both about same loud

57- 100 L 100 Anal -
old style 70 002 mea 100 L
Quality 105
but something
skips -
Same with Alumnator 110 loud
Quality 105 -
but something skips
+ not even.

Both Meas old style more mellow &
round but something at times
comes in wrong Center al
loudness

57 generally is better.
but either have preferable
quality although 57 is good

65. 14/6 - japp. Load 105
 quality - 110 - but tendency
 is to blue - Kennedy says
 paper has wrinkles -
 Tightened it - Load 95
 Quality same as 57 -



X 3 Violin
 in Union
 "Over waves" by
 Ear - Complaint
 tone don't seem to
 be in Enderman
 Records like

one Load past Violin
 players

11A

Notice when 3 Violins play
Air Bach without
Piano or Leader is
very poor
but when Leader
brats times it
improves it enormously
When each violin makes
long notes it is steady
generally but when
all three play same
note its Wavy as to
Volume ~~is~~ is irregular

When I took off the top of
Ch Room - The waves nearly
disappeared - So the
phenomenon is due
to something of movement
of a small air volume

When 3 Violins were
used it was fairly
loud, but when
Cello & 1st & 2nd Violins
shaved to side it
was very much
weaker - any

Recession from Center
line is very noticeable
in relation to Volume

Taking off top has
apparently not
weakened Volume Much

The Cello is weakest
Player -

57 Piano - Taking off
top has weakened Vol
Very little say to go
quality is improved

The one note which was
Very loud ~~is~~ is now normal
& mellois —

To stop these hyper sec wavy
it looks as if the room
should be high & wide —

The violin is the worst
instrument for Volume
Piano the best.
If we get Violin with
Volume all else is easy

Room Tap off 12X12

#105 001 mica
001 x $\frac{5}{16}$ alum. Center

50% only bond of 57 -
Mellow quality good

The 12X12 is 25% weaker
bond than 12X9 with tap on

57 - 100% (same)

66 - 110 " mellow - but contains

water blistered seat

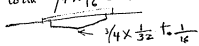
65 125 " same defect as

66 - water blistered seat but

very mellow & fine grained
but chunk on top of
blast

65 - Tapered tube - Domes head
 $1\frac{1}{16}$ " 0015 Disc paper

66 - Tapered tube, Domes head
 $1\frac{5}{16}$ " - 0015 disc paper
with $\frac{3}{4} \times \frac{1}{16}$ Cork underneath.


 $\frac{1}{4} \times \frac{1}{32} \text{ to } \frac{1}{16}$

57 - Reg flat head - no paper
paper 17 all size 0015 paper
cheaper -

65 Star paper
on Piano -

Notice base is better on 57
than 65 or 66 - at end of over W
1st part, But base all three
seems better on 66 & 65 -

Notice 65 is on verge of
Blubs - 2 feet does notice

65 Tightened up slightly is
now in every way superior

to 57. More mellow &

10% @ 15% louder better
base

The scale on 57 is poor although
the playing seems good -
there are 2 or 3 blubs & it
sounds on scale unnatural
whereas no blubs on 65
& natural = 10 high notes

played on high before &
heard any music -

It would be hard to beat
65 on scale -

65 = 3 + 5 ft 2 violins
our Bach not much
difference in Val - Val
good, 3/4 of cohort will
do commercially

Violins in Unison -

Very good in fact good
enough with 65

Top of Den off -

Violinist in center line

We get the Waxy

Should expect on funnel standing
on this -

2 Violins ~~on~~ playing

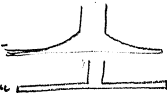
together increase loudness
apparently over 1 violin
they easily get away together
with Beats

Sextette Lucia - no music
except Picis - Den 12X12
top off -

fixed position, pretty fair
but ill defined at points

Industrial walking about
same as on stage
This is enormously better

harder & far more
Dramatic - ~~25%~~ 25%
more loudness & it
will be OK as to
loud & quality -
No interference -
It sounds like
Real Opera - Every
voice is separate &
no noise as they come
together -
with good singers &
20% more loud would
pass it

It looks as if - 
was better than

In all these tests there is
a difference due to long
funnel or Hare sides
but its not bad -
+ if not eradicated or
diminished well still
be OK. - But think
can get it down

65 is far better quality
+ loudness to 57 -

57 which is not tapered tube
or has a domed head -

Does 65 have these its an
improvement,

64-65-66-

$\frac{7}{8} \times 0015$ - Doomed head
taper like ^{summit}

70-71 - Some $\frac{7}{8}$ to $\frac{1}{6}$ high
0015 - aluminum as
sketches by K.C. -

65 & 64 are best -

66 next -

75 $1\frac{1}{2}$ paper

65 ~~1/2~~ food paper

64 - nearly a Dup but quality
not quite up on 2 notes.

66 - 80% land - ✓

70 50% land ✓

71 55% blubs badly ✓

69 75% land ✓

76 - 75 @ 80 land ✓

75 about same as 65-64
in land & quality

65 64 75 all have a blue
in same place in Soldiers
Chorus —

Otherwise OK —

3 Violins 2nd, 2nd + Cellos —

Top off room — makes it as loud &
not louder — 64 63 + 75
all loud but badly blues
2 ft from horn +
notice saw tooth in violins +
wooly —

We now try same thing
4 ft away from horn

Blue is just as bad —

Think must have the top on
will put it back on & try it

The violins don't sound much better
but tone as whole much
improved — may be that
bad tone close up is due
to Dia working too much
on limits +

Top put back not so loud
blues just as much but
quicker little more mellow

It looks as if Tap off will be
louder and nearly as good
if it is essential for Convenience
to have it off - But Tap on
will probably give somewhat
tone if not so loud —

The 3 Recorders 64-65
75 = have been stretched
for Friday Sat Sunday &
now 2 per Monday
shows they are tap sensitive
having lost part of their
stretch & are more
sensitive — Friday
there was only 1 or 2
weak clubs & now all
club badly —

tightened up 75 it no
longer blabs on Golden
Chorus - ~~but~~ fairly
loud - all Violins
& Piano -

but they don't play
right - on high Violin
twin - & the 2 2nd
Violins are wavy
in fact altogether
too much wavy
in it - when they
give long notes,

Think this music
should be printed on
cloth & wire stands
used coated with
felt noise going on
all thru but faint

Tried ~~65~~ 55 - Cork candel
Shells all over - 14/16 -

no aluminum -

$\frac{1}{32}$ 50 lined - Derolches
 $\frac{1}{32}$ 0015 paper

66 - About same as

⁶⁵⁻⁷⁵
others in low -

quately about same

$1\frac{1}{2}$ 1000 paper - like 65 except
paper is 0015 instead of 001 as
in 65. Blues in 2 places

on Soldiers Chorus &
Violins, Piano & Cello.

Should now try 002

0025 003 - paper

76 + 77 Both have
Hubs in with Soldiers
Chorus - 77 has 2
not very bad compared
to many others

75 - the tightened one - of 100 (and
then 76 is 110 - Aural ok -
Jap paper 003 12/16 at center
amplified arm

77 110% (and - 003 Jap paper
12/16 - at center standard
arm - Aural ok -

Burke made 76-77

Viola is a violin with E string left
off. + one lower tone string added

~~It is~~ a Violinist Can play a
Viola after he has had practice

A Violin Can be tuned to be
a Viola - but must play
one note lower, not
easy, as he would have to

Use Violin music & play one
note lower, he could not
use Viola Music —

By putting 2 $\frac{1}{32}$ thick
rubber under E string it
softens it & makes
reducer tone —

If Rubber put under all
lowers volume — acts
like a mute

Best is only to use
under E string —

I noticed that if 2 Violin players
tune E string perfectly that
they can play together
quite perfect without beats
But if one violin is just a
shade out of tune you hear
the beats perfect, (12) Saw tooth.

If all violins are discarded
& Violas substituted, no change
is necessary in Piano or any
other instruments

But all the Violin Music would
have to be rewritten for Viola
Except where performer could
transpose it as he played

I notice two Violins each playing
separate on say E string
Can make even volume
Sustained notes

but when they play together
The sustained notes are
irregularly wavy in volume
& after many experiments
cannot get them to play
even volume - some
notes are steady but
most at 3 per second
Wavy - at times there
are 10 to 15 per second but
this does not occur often
This is undoubtedly due
to fingers not being in
right spot - I also

believe the irregular wavy
 $1\frac{1}{2}$ per sec is due to the
movement of the finger on
the string due to disturbance
of bowing —
When they do the usual
vibrating the wavy
is exaggerated.

Another thing neither
Violent Carl nor these
"wavy"

Two Violins playing same
Scale together - E strong
the tight bow makes a little
less wavy than loose
bow

The Conspicuousness of the
wavy diminishes from E
tuning to C₄ - E is
by far the worst,

In double stopping, the
wavy disappears & we have
5@6 per second piece Great

They do not seem to be
able to strike the pitch
at all on both playing
same note double
stopped *

2 Violins -

1 plays E the other next to it
no wavy —
no " on all others
but when both play same
string wavy is horrible

When one plays Octave higher than
the other on E string no wavy

If 1 Violin plays a note the 2nd
one plays a 3rd of the 2nd violin
plays a 5th - there is no
wavy

C E + G This is the 3
Natural tones - & are
OK

75 & 66 Same loud
Equal same

66 has no surface -

67 90 loud some surface

65 95 " Strong loud surface

all 002 paper

14/16 disc album 0015 thick-

On a piano the Right hand
plays the melody the
left the rhythm, bass or as
the say harmony ~~sub~~
~~to be~~

Two Violins - one I put a
 clamp on E string at a
 certain point - The other
 Violinist played without a
 clamp - The notes were
 entirely free from waviness
 S S S

Notice when double stopping
 on first trial both strings were
 not same loudness + it didn't
 sound like DS very poor

When I called their attention
 to this they bowed both strings
 with equal strength then
 it was beautiful -

A Cello $1\frac{1}{2}$ ft from edge
 Horn 75 Reeds scarcely any
 louder than 4 ft away
 One big blue wet $1\frac{1}{2}$ liquid
 Enough for Reg -

75 - 100% Gork obelisked all over
 #55 $1\frac{1}{2}$ / 1000. Scratchy -
 55 wisengung OK - 2 ft away -

#47 - Dia 1" Dia Jap paper
 0015 - at sec 5/8 0015 -
 Reg cum 9 Saphires -
 75 100% loud
 47 250% loud
 quality only fair

C D + G

played by 3 Violins No good

No beats but not sweet + ng

C + G 2 Violins -

just as bad, Even worse

no beats - or saw truth

Viola 2 Violins

Playing C & G apart

OK, Melodious

Sound —

2 Violins 3rds + 6ths
Good - Sweet, + OK -

ditto 2 Violin 3 + 6th +
1 Viola Octave lower -
pretty good,

with 3 Violin 1 3rd 1 6th +
the others in unison Get higher +
ditto lower Next so good
but they may be that it was
reported by poor playing
sounds pretty good
however

Hereafter 40% is
100% done

45 - 85 @ 90% done
3/4 dia 001 $\frac{1}{2}$ 0015 al.
scratched bad -

69 - paper 003 al 7/8 x 003
50%

71 ditto 50% 1 1/4" Dia -
Paper too thick -

45 = ok for Bull Bass
3ft away -

Bass Drum 4 ft
left, Knife out -
Thumb Cup jumps
will weight it -

Tried 2 Violinists both run
scale together, found 5
notes had beats.

I then put ear piece + tube
to one violinist ^{2nd} & held
Cup over other Violinist
Violin — both run scales
+ all notes were perfect
no beats. The one with
Ear piece kept in tone
with the other violinist
because he heard the
other means Violin
louder or as loud
as his own

As Compared to 47-100
Number 46 - is 75%

5/8 Dia - 9/32 Alum
~~5/8 Dia - 9/32 Alum~~ 0015 Cellulose

Quality good -

45 - 3/4 head 0015 paper
1/2 x 0015 - al Disc -

This has been corrected

90% -

X0100 - 1" hand bag pattern
002 paper 5/8 x 0015 -
Al disc set with jig -

95%

3 Violins —

G 2

1st B

2 G

3 D

He only did a little on
this —
This is rather
good —

1st

B

1st violin

G

2nd "

} NG

2nd

B

1st violin

D

2nd violin

47

100

100 changed again 75%

Jan'y 3rd 1916 —

Picking up better the Telescribe
transmitter with small funnel

~~4~~ telephone head success
to 3 violinst — 1 Cello

1 Viola: 1 violinst plays
funeral as the others
perceive his pitiful to
stop those & —

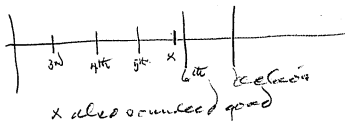
one second beats.

Ultimately whole

Orchestra should
have under Violinst
or tempo conductor
if we ever expect to
more properly play
music

playing one string A
Continuous note, the
other violinist run down
his string noting spots
where it sounded

Quot we get this



All these fundamental
are complements



102 + 103

Bad? — like this which is:

44 — 100%

10 100

110

10 hands 0015 paper

5/8 X 0015 cd disc -

Crackles
may be chips

103

90%

Very Crackles
may be chips

100

100%

102

100%

Cannot hear
any scratch

103

100%

All good — But none

So loud as 100 when 1st
heard — 100 plus then tightened
to that accounts for being weaker

With #100 Dried Egg Drum
Original weight 55.7 grams
Added 14.8 grams to
Keep box from jumping
off record -

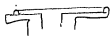
The 14.8 extra weight prevented
it from jumping at
10 ft, which it did before
weight was added

It jumps at 3 ft
Makes the usual club

but its slightly cheaper

In practice this shows
that we can control
quaddy by Chamber
size to a great
extent, Sharper by
Small Chamber

More round & mellow
& duller by larger
Chamber



#100 -



102 & 103

The 102 & 103 are softer & more
Mellow - 102 is 105 as
compared to 100 & 103
is 92 as compared to
100 -

The quality
is very striking in
entering the chamber
Cant say now which is
best for Piano. both are
pleasing - Yaller, like 100

4 Violins running scale
on E string -

3 Violins give 3rd note
loudest almost double
loud -

One gives 4th note loudest

3 gives weakest note on
the 8th - The 7th being
loud & the sudden low of
volume is striking, its
3 times weaker

One gives 4th note the
weakest,

Notice none of the Violinists
pay any attention to
volume of sound on
E string. Their bows
wander to & from the
bridge in even running

Jan 6 1916

E String Experiments

the scale

When they played the same distance from the bridge the loudness was almost as it should be all along the scale although noticeable drop on G⁴ note. There seems to be a break here on all violins -

One Violin Guarneris it is said to be in the poorest of condition as it gives a noise sound on many of the 2 string notes, both with gut & metal strings or all bows - This is strange

Inquire -

murmuring over lay

False notes -

Nothing stops it except by bowing various ways & it appears inherent in the Violin itself -

Mr Bach - for a long time
we couldn't make it sound
well at all - Then found
Wilhelm's version was used
which is written higher &
for the worst part of violin.

Got the original in which
solo part taken by violin
in lower key
used Master Violinist,

This was great improvement
then found we were too
slow in tempo made it
quicker this was a great
improvement then made
tempo beats sharper &
more abrupt this was
another improvement
then set high note violins near
funnel - another
improvement. Set
Cello further away
this improved ^{the} orchestra
Violins playing melody
in all parts

found an long sustained
notes at end of a part beat
1/2 to 1 sec making Volume
sound Wavy - Captioned
the 2 Violinists to be more
Careful + play exactly to
Master instruction, This
improved air

Finally suspected that
the 2 Violinists playing
Solo could not play together
Good Discard one of
used only one solo
Violinist This made a
Very great improvement
Found his Violins to reach
Covering the high note
Violins, Moved him away
further from front -
This was the final
improvement + air
Rich was fine much
better than our Regular

one - Moved Solo Nalin
Still further back
This way no improvement

100 100%

116 $\frac{7}{8}$ dia $\frac{1}{32}$ dome
90%

101 1" Dia Curved dome
like Disc Reflector -
105%

100 Blubs on singing
Reg landmass but only on
one note -

It may be cup counts is right although
singing was not loud enough to warrant

it = Possible - The weight &
elasticity of wax may bring
weight in line with certain
notes & cause it to jump &
blub - - tried w/ ~~gypsum~~ but
it only demonstrated blub a little

Tightened it & learned
75% no blub's - clear
but less volume
too much tightened
it too much

100 100 - 1" Reg

115 - 96% 7/8 -

$\frac{1}{32}$ Bone - 8015 paper

$\frac{1}{2} \times 8015$ all these

116 - 90%

Same as 115 -

117 - same as 115 - 95%

100 100% Paper

118 - 75% granulely sharpen

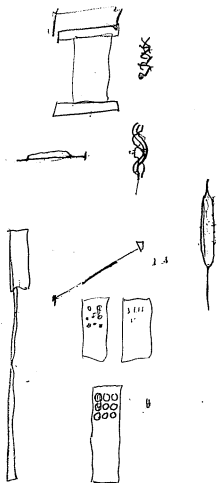
119 - 40%

120 - 65% granulely like 118

$$118 - 119 = 120$$

$\frac{3}{4}$ diameter
0015 paper

idl disc $\frac{7}{16} \times 0015$



100

100%

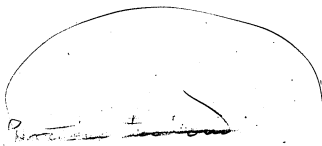
102 - 1" Dia - Celluloid

1/32 Dome

0015 Celluloid - 75% hard

Aluminum Disc

5/8 X 0015 —



Sextette Lucia 101 Records

1st test -
Arranged Regular

Blubs a little, rather enjoyable
Sophrans too loud - don't hear
alto, some noise -

2nd test. 101 Reds.
Arranged - Union Barcelona
Smile -

Clearer & more enjoyable
than 1st - Sophrans not quite
so loud but still test loud
Don't hear alto

3rd - 101 Reds
Arranged - Union Barcelona
quicker & less omitted where
singing Octaves with Colorado
Just as much noise as in 1st test
not so enjoyable as 2nd test
not so dramatic, Sophrans too loud

100	100
101	100
102 -	80
103	95-
	95-

4th test 101 Red

/ Arranged
Reorienting due to cartone
into a harmony part,

Saphraus too hard on
1st part - Boartone too
hard - Not very Eucyrtella
Poor Swing to line

100	100%	} Celluloid -
101	100%	
102	80	
103	95-	
104	95-	

102-3-4 Exactly same as
101 Except Celluloid diaphan
in place of shellac paper

1" head $\frac{1}{32}$ dome
Celluloid 0015 - Discal
5/8 x 0015 - paper arm 008 diaphan

Personal Equation

Sholnik	6.5	
Featz	6.75	7.75
Hayes	7.25	8.25
Dawson	8	7.5
Ayrso	9.25	
Ingrund	9.75	9
Applegate	10.5	10.75
Strickett	10.5	10.7
Walsh	10.75	
Anderson	10.75	
Sholder	11.5	
Solkoway	12.5	
Eadie	12.75	
Renson		10.75

Spring Beautiful Spring

Map - of position

1 st Violin	2
1 st "	10
2 "	9
Cello	14
Viola	4

Pretty good - High Violin - vibrato
too much in places - also scrappy
on 2 string - pass. etc. its
beats between the 2 1st Violins -

100 — 100%

118 }
119 } $\frac{3}{4}$ Dia Celluloid Dia
120 } .0005 — AP disc
7/16 x .0015

118 75%
119 60%
120 75%

Notebook Series -- Notebooks by Edison
Notebook, N-16-04-01

This notebook was used during April 1916 at Edison's winter home in Fort Myers, Florida. All of the entries are by Edison and pertain to the manufacture of disc records. Included are descriptions of experiments to be performed at the West Orange laboratory and speculation regarding the source of defects in the records being produced, as well as details of the experiments performed in Florida. Many of the experiments planned and recorded in this notebook relate to the coating of disc record blanks with Condensite varnish. Included are notes on the composition and consistency of the experimental varnishes, along with descriptions of annealing tests performed on the records, experiments to stop "creeping" of the varnish, and methods of applying the varnish evenly. Also included are drawings of machinery intended to apply the varnish evenly, a list of resins tested for solubility in alcohol, and the notation that "We use too much 6/4" (hexamethylene tetramine). The notes indicate that Sherwood T. (Sam) Moore assisted Edison. The front cover is labeled "Disc." The pages are unnumbered. Approximately 60 pages have been used.

Fort Myers April 1 1916 -

poured on small discs 8 regular Var
containing 100 Resin 155 alcohol
with 1% Sandrac as compared to
resin content & the irregular amount
of Negrosin -

Whether thick or thin the plates were
even & showed no trace of wrinkles

In drying there was no Creeping

The Varnish set down by Hoffman
is free of Para or 6/4 -
In using it to get reg varnish
to each 265 grams of Var add
1 gram of Para & 7.9 grams
of 6/4 - This makes it standard
Varnish -

Expt for North -

Use Thermometer on press -

Transfer 1412 low rim reg Var
reg schedule. B.M.T. remove pressure
to 100 lbs when cooling time comes
+ then cut off steam when it
reaches 180 remove pressure &
take out transfers putting in
box till cold - then print +
test for Cracks using reg way
for another 12 as a check.
Went to see if Contraction not
under pressure is an improvement

North Try a number of schedules
1914 - blank low rim to find the
lowest number of minutes the
final Curing can be done in
+ have free release, this will
help out print.

Theory = We use too much G_4 -making
Condensate too brittle after large amount
of high temp curving in press,

If we use less G_4 there is bad free
release, birds + pull outs. It is
very desirable that the final
record should have a horn cut

To obviate the poor release we
can use flat or low rim plates
that helps some.

2nd low rim plates another
perhaps Nickel plated -

3rd Add more Sandrac this
may make it more brittle than it
does good,

4th Chill down by Ice Box to get
free release,

5 = perhaps something decomposable
giving gas around 300° will
make free release

6 = possible Oil Ben Gm Varnish may
do - ditto Sesame if it can be got in Var,
it being used in alcohol -

7 A double layer on plate, 1st
layer a very thin coat with
Red $\frac{6}{4}$ or perhaps higher &
Condensed at 175 or less.
Over this lower $\frac{6}{4}$ Var, to cut
horny.

Scheme -

Flow thinnest possible Coat Varnish
or if uneven lacquer Varnish on.
bring up in oven so it just goes
rubbery - Remove - break bubbles.

Then flow or lacquer again -
Condense + break bubbles

Then if needed flow - + fully
Condense,

This Scheme gives great flexibility
will stop bubbles, gives even
plates,

It is possible that it is not
necessary to condense each
layer - Dry both ways -

Expt -

Flow 8 small plates seq var
bring up just to Rubbery state,
then Cool & soak 4 in alcohol
& 4 in water to remove
6/4 & Para Etc; Then
put back and run seq
schedule to see if 6/4 is
really removed -

Idea

Varnish plates etc var equal to
say 10 cc Condensed rubbery
then flow over shellac var
dry & transfer or Victor mix
only finer - or use got of Vic
mix between plate & Blank

Put a saturated Benzal Sol
containing 140° MP Paraffine
around edge of 1 1/4" plate
dries it - then flowed with
thinned no 6/4 no para var
dusted - it under run the
Paraffine film - Don't
think this is practicable

Apr 1 1916 -

Just tried good Expt - put 4
of old 3 yr old records which
all crack badly if point of
knife be stuck in around it
into a closed Can with
Alcohol lamp under &
Thermometer under

Run air inside up to
180° Fahr & then allowed
Cool till 85° Normal
temp = by Wicking
Edges NO cracks develop
by sticking knife point

all over on both sides
not a single Crack
developed —

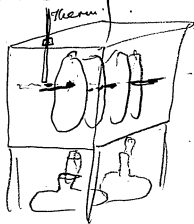
This Experiment shows
our records should
be annealed before
testing & shipping —

After annealing &
tested them & found
slight effects, one or 2
had lead run out
due to annealing
but the Experiment

was very crude then
bottom of the record
too hot, & uneven air
no circulation -

Will ~~rip~~ up to do it better

This was way it was
tried



It is possible we can

Remove the Prints from moulds
at 150 @ 180 ° f in closed
box to cool gradually
between papers & render it
unnecessary to anneal
in a furnace —

April 1 - 16

I notice when I flow the Rag Var
no para or G4 it don't creep no
wrinkles no waves & frying
but when I dilute a little
with alcohol it creeps & fries &
has all the bad properties of
uneven plates —

It looks as if low alcohol as
we already knows is a good thing
& I believe we should use
quicklime to diminish over
water & it will dissolve
the G4 OK — I believe also
rapid Evap of alcohol
Condenses water from atmosphere

Possibly our Evaporating
or plate if flowing room
needs conditioning to
have a dry atmosphere

Hoffmanns Var without Para or
6/4

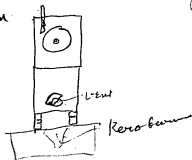
265 grams Var add 1 para a
7.9 grams 6/4 - This Make
Reg Var

$\frac{1}{4}$ of this is Varush 66.2 grms
1.975 6/4
250 milg Para

$\frac{1}{8}$ is Var 33.1
987 milg 6/4
125 " Para

Apr 2/16

Annealed Records in high box
there



Started with 6 Records all
tested for surface

Start 11:10 am 78°

11:40 84

12:10 106

12:37 124

12:45 130

1:15 138

1:27 140°

Cooled - Tested Records (2)
for surface, no change - but
knife point gave cracks 1/3 of
circumference - 4 opposite
sides ^{one} This temp too low

2nd test, These were in 1st test

With 5 Records 1 of which
cracked itself - it covers one of the
2 I took out to last pressure
done in handling as I put
them together & they needed on
each other -

Started

At 450 Pm Temp	136°
455 "	142
5 pm "	146
503 "	147½
510 "	152
520 "	158
535 "	165—

Shut off heat at 165 to
Cool down - This time
had gagging around upper
section to slowly cool —

3 surfaces ok 1.5 cracked
only little ~~cracked~~ 1 bad
Temp too low at 100 unwar

After pouring about $\frac{1}{2}$ portion
on each plate, a scum formed
like land ice from edges run
out over surface, $\frac{1}{2}$ the area
still bright - with worked on
if run near it but it does not
~~creep~~ Creep

Think 350 Mils may work
with Reg Alcohol -

Stearic Acid or Stearine

No good - Scum forms
presents digging
also Bubbles horrible
in even

Apr 2/16

Experiment to stop Creeping
Reg Var -

Some Amyl Alcohol NG
to this added Camphor NG
then more Camphor NG

Made fresh lot Var Reg
+ to 33.1 Var added 250 Mils
Stearic acid -

This aids the Creeping Very much!
It all dissolved - the surface of disc
on dull in few spots from precipitation
of Stearic. It went more -
I will add 250 Mils more
Stearic to see if I can get dull
surface - This will be 5% Stearic

I find that the Creeping is
exponentially increased the smaller
the amount of Varnish used per
plate,

500 Mils is too much Alcohol in
Var will not carry that much
Stearic was pretty full bubbles
added little Alcohol & all became
clear

Reg Var with only Stearic acid
does the same thing -
perhaps the Camphor aids a
little but not much -
Sheets Easily rolled like
pic crust -

The Camphor amylal sheet
is not sticky in the least.
Plain Stearic is slightly but
probably when driven will
be same -

Fine powders could be
rolled in this dough -

Made a batch of Varnish with
50s Mily Stearic, this is more
sol than Stearic but had to
add a little Extra Alcohol.
it sets like Stearic + about as
good. The trees could cover
surfaces just the same but
finer = I think 350 mils
to 1/8 portion will be ok

Phenomenon

I added to Reg Var some
Amyl Alcohol, then added
some Camphor. These addition
not working I added a lot
of Stearic Acid which all
didn't dissolve. There was
pieces left in it. When I
poured the Varnish a seam
formed over surface, probably
precipitation of Stearic Acid -

As this dried very slowly I
put disc on top of water
jacket even till it got
sluff - Temp about 150@160
I scraped Varnish off with
knife to a dough. It was
tension + not the least
sticky - Rolled it out into
a thin sheet + it didn't
adhere - it act like gutta
Serchia. Could easily
Roll sheets of this
+ Condense them -



tested the 5 Records for
surfaces -

In 5 faces no change in
surface, others had increased
considerably - Whenever there
was a RC at 1st it increased
very much -

The Volume of sound
diminished only on one
Record & this it did on
BOTH sides showing it
never was cured properly

Altogether it looks as
if we can evenly season
at say 165 & cool slowly
there will be no cracks
None Developed on these
10 faces with knife
point -

3rd Annealing Test -

5 Records - previously
tested with hands to ear
& recorded - will run
up to 180° Fahr -

Started	10 40 am	84
	10 55	84
	11 am	100
	11 15	116
	11 25	128
	11 33	134
	11 55	140
	12 07	144
	12 40	152
	12 50	150
	1 15	156
	1 32	163
	1 47	166 -
	2 pm	168
	2 10	170
	2 45	176
	3 10	180 -

Closed up to cool off -

Note

I previously put 18 Reg Van plates in water bath brought them up to 180°. They condensed & was going to put another flow over them. But Fred told my mistake washed them -

I noticed 8/10 of discs had no bubbles - Chew it to Rasins. Alcohol ^{resins} should be made first & seasoned a week before use with Pour & 6/4 -

1st Condensation -

On 12 Noon	105°
12 15	118°
12 20	125°
12 37	140°
12 50	146°
1 05	151°
1 15	156°
1 47	159°
2 pm	161°
2 06	162°
2 37	166°
3 08	170°

Cooled down out at —

for double pour -

Flowed 18 small plates with Reg solution containing 4% of stearic acid - Had to add a little alcohol -

I note that when 1/2 proper amount of Varnish it is lower in center than edges - it tends to run to edges but don't fry or break like reg -

I fear it is not what we want although they even up in 1/2 hour after pouring - not perfectly even but fairly so - It will depend on the double or last pour.

I poured 2 or 3 heavy -

I notice 50 min after that they are getting very even only 3 or 4 not evened up good

Put in oven - There were dents but generally they were quite even - The 2 thick ones had no formation on surface -

The results of Schedule on back
Page nearly every one full of
001 @ 002 bubbles - But on 7 thin
poured no bubbles - on this
2 thick poured, one Mass of
bubbles almost a froth or 2 or
3 $\frac{1}{4}$ " bubbles -

NOTE This shows that
double pour & proper
schedule bubbles even in
Very BAD Varnish well be
absent =

Creeping Experiments

Rag Var - Drop water on top ng
don't spread -

Var slight dryer & creeping - drop
alcohol Cause an almost bare
spot & creeps very much Var
recedes from it rapidly

Var poured - Gasoline flowed
over - This is perfect NOTE
dry slow - translucent film

Var touched with gasoline
having alcohol in it -
This works fair -

Dsc coated with gasoline
containing alcohol, the
flowed - Not good -

Menthol in alcohol
drop on flowed plate
ng

Chloroform poured on plate then
flowed

Etcher mixed with Var NG
Very bad -

Chloroform mixed with Var
NG -

Japan wax in Var NG

Stearine 1 gram to $\frac{1}{8}$ part
Stops creep by forming seum
but all night didn't dry absolut
out, This seum is NG -

Paraffining Edges of disc NG
all over NG

Phenomena -

Flowed Center of Disc $\frac{1}{2}$ 5/8 dia.
+ some irregular covering

$\frac{1}{2}$ + $\frac{3}{4}$ of area with Var Rag
let it dry 1 hour. Then
flowed balance of Varwash

After a brief fry which is
rapidly over with draught
req. then building plate
entirely perfectly even

This is probably the best
solution of a single
pour

The best way on big disk
would be to flow 3" about
then spread to 5" with piece
metal & dry 1 hour -

think 10 to 15 cc is enough
then flow after 1 hour
dry -

If double coat
flow this way baskets 175
then spot flow & dry off

Breaking bubbles -

& give final Reg Schedule
bake -

The only doubt is -

Will the 2nd Coat Varnish
run into the fine holes
broken down. Won't the
air prevent it — S

S S S S
· · · ·

2nd ~~Experiment~~ on Double flow -

No 1 Shelf Reflow of the 1000
3000 plates

No 2 Shelf $\frac{1}{2}$ flow of Reg
Varnish -

Make it 5 Hour schedule -
put in at 100 -

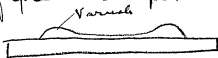
Will not try about

4th Experiment

9 plates, with light spot
flow dried well then a $\frac{1}{2}$
flow out this - after baking
to 180, found 2 or 3 bubbles
on all fins - only few open
on the 9 or 3 large bubbles -
Break all the bubbles open
& will spot flow - then
the other $\frac{1}{2}$ flow &
final bake to 200 +
then to 235 -

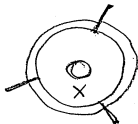
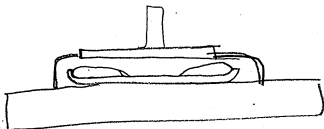
Notes

film even on flat plates
always draw towards area
of greatest Evaporation



This is true no matter what
Varnish used -

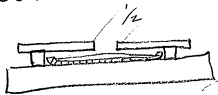
When the alcohol has
reached a certain
stage of evaporation the
film draws flat under
good conditions but
generally the center
gets too thin & it does
not flatten perfectly
leaving a hole of
 $\frac{1}{2}$ thickness in center



Evaporation only at Edges
give a permanent hole in
Center

$\frac{1}{8}$ smaller Dia to X
4 $\frac{1}{16}$ from surface of Var
gives low place $\frac{5}{8}$ dia

On the other hand
If made thus



This gives a raise in the center



Raised part about $7/8$ dia

$1/2$ sq in $16/8$ - or $7/8$ is 49
or 3 times the area

Resins Soluble in
Alcohol

Zanzibar Seed - Dissolves Good

Kino -	"	Some
Kaydaga	"	Slight
Spurce	"	Very Good

Amber Congo Copal " Ballo, to
Elastic mass - probably some dissolves

Jacamaha Gum - Dissolves good
but will have to be filtered - full dirt

Gum Catachu Dissolve Very little

Aceroidees gum Very Soluble

putahung powder, dissolves some

Indian gum - not sol

light Ester gum Very Very Sol

Gum Euphorbium Doubtful,
Myrrh a little

Kauri #1 Balls together

Ammoniacum Tears poor

Gum Senegal poor

Guaiaac, No considerable must be filtered

Gedda poor

Karaya Doubtful.

Gambanum Mass poor

Locust tree gum Quite Sol

Mastic - Balls

Singapore Dammer Doubtful

Aspiratum

Batavia Dammer

The law is that the Vannish thins
the most at the greatest point of
Evaporation & will draw it away
from point of small Evaporation

With an open plate the air
of which is blown across it
in one direction. The Vannish
will be thick at X & thin at Z



because wind gets ^{more} saturated
with alcohol as it passes
across the plate & Evaporation is
quicker at Z

The only way to get Evap
Even is to blow directly down

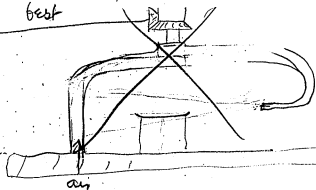


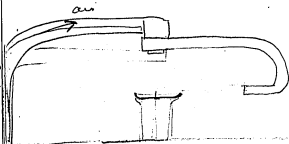
& Even this will have to be

Experimented with to get it even



A rotating air pipe would be the best





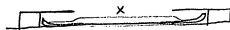
or rotate the plate slowly.
 think this will be simpler

On high humidity days lots of
 water will be condensed by
 the rapid evaporation of the
 alcohol to prevent this
 the air must be heated slightly
 by passing over steam
 coil —

The experiments with the center hole
for prevent shallow centers & to
produce an even flowed plate which
was a success with the $1\frac{1}{8}$ plate
is a failure with a Reg size
Varnish plate,

The Varnish creeps to the exact
size of the hole

With a hole $7\frac{1}{2}$ " dia. -



It was this shape $2\frac{1}{2}$ hours
& the outer edge was extremely
thin of Varnish -

While drying the high part
X was very matted &
while it eventually got smooth
it will not be ~~the same~~

Should we want to know
that extreme outer rim should
not be thicker than other part
all that is necessary is to protect
it from rapid evap.

○	○
○	○
○	○
○	○
○	○
○	○
○	○

4-11-16

Tried to stop cracking of old records by soaking surface with alcohol but it does not prevent cracks when point of knife put in -

I notice that if strong sulphuric acid is put in gasoline it browns the acid slightly - If now formaldehyde is put in a thick concentration product is obtained it gets very thick by stirring & the gasoline disappears - leaving a dark red pulp. possibly OK for Disc or Lac

Evening if Moore find that Red
Centers disappears when new
Alcohol was used instead of
Alcohol used in the blowing
Room - both in the blank
then Water or Vac drier
don't come out. The friction
increases & the blank don't
squash down so the Centers
of Varnish prints - as the
Center is always low -

The remedy is to make an
even flow plate by the
blowing process -

& Second raise the standard
of our Alcohol by using
highly sensitive blower
lines -

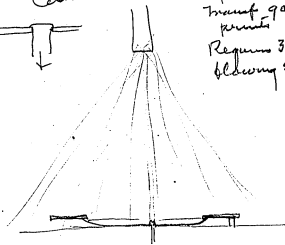
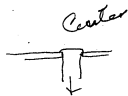
In the case of making a flat blank

Perhaps 3 spots on steel disk would do it, grfile, air, + polish



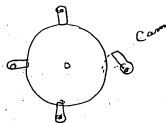
Careful Examination of Rubber plunges should be made right along

Also the turning off tool & platten —



40000 plates - 95%
OK plates, 90%
Transf 90%
prints
Requires 333
blowing stands

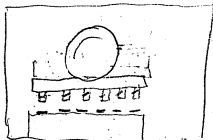
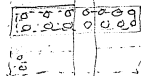
Hold down 2 edges of canton & blow var till set this will make thickness even
Even if plate is warped



The phenol has water in it
 this dissolves certain salts
 it may be blowing warm
 air thru pipe of the machine
 may eliminate the water
 + precipitate the salts
 + the phenol fillers
 this will eliminate the
 salts without the
 necessity of using acid

If this don't work + its
 an alkaline combination
 with the phenol then
 HCl gas might do as this
 would not likely to
 combine with the
 phenol - but the HCl
 might attack the
 still pipes -

Perhaps passing
 more CO_2 thru would
 break up combinations
 + precip the salt,
 forming a BiCarbonate



WZ can always correct some unevenness of Veneer by varying the shellac in powder & with a blown plate without clamping it flat, more Lac will have to be used than when it is clamped

Also if the fineness of the grinding increases more shellac must be used as increased fine powder tends to make it dryer & ~~the~~ blank will be less plastic & not take care of unevenness of the plate veneer -

Also if Alcohol is low proof more shellac must be used as more water will be left in powder & this acting on Lac makes more friction & less plastic

What makes free release is the decomposition at 125 lbs pressure. 330° F. of something in the Varnish this tends to strip the Veneer from plate. If this substance is diminished it will tend to diminish the free release -

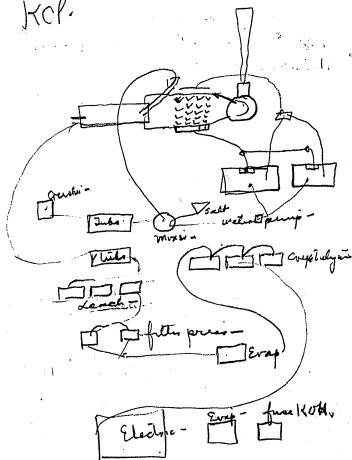
It's probably something in the Dandrac that makes this gas =

Also another thing that makes for free release is a low rim plate, or no rim at all,

Transfers that would stick badly on high rim plates wouldn't stick at all on a flat plate,

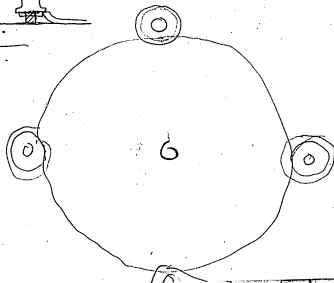
Dents & Buckles must be got out of plates -

KCP.

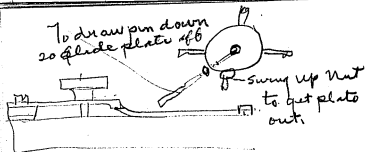


See about plant for
100 lbs daily para amide
Phenol -

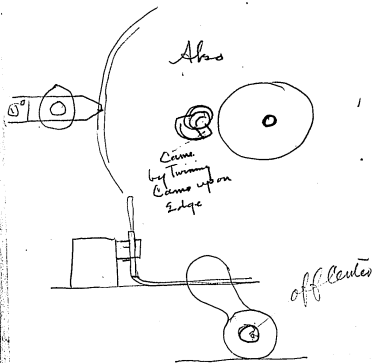
Clamping down plates
is essential as they cock
up $\frac{1}{8}$ " some



To draw pin down
20 glide plate off

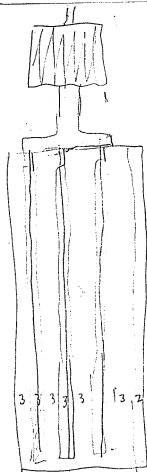


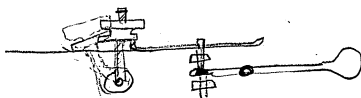
Also



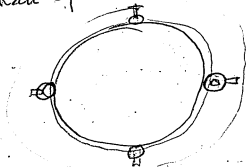
Cams
by turning
Cams up on
edge

off center

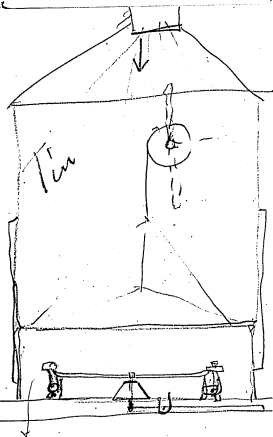




Get a more sensitive level
than spirit level -

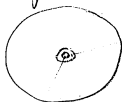


Use our waste
myrbaine acid to make
Paranitrophenol -



See that all the buttons in moulds are thin so they do not take the pressure off Centers.

I found on last Campaign
2 too high



this

Half -

Moore said he would
have them fixed -

Investigate if they are
not now making finer
powder hence less
flow for same shells

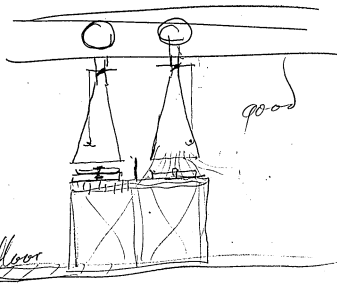
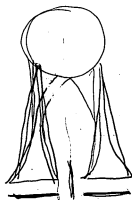
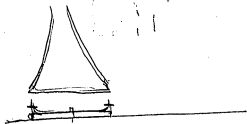
Test all the records now
put away for time test -

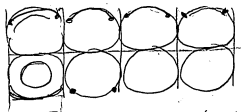
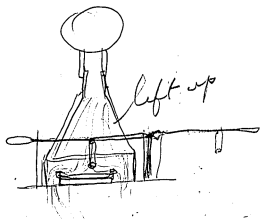
Get 100 Records from
Baldwin & make
Knives tests -

See how plates come out
with filter press
Varnish -

Tell Moore, Howard

Baldwin pass
ford line cracks -

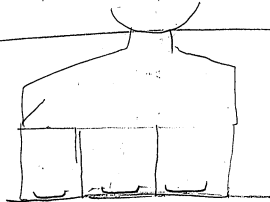
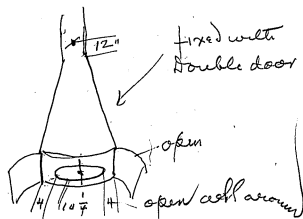




front drops down but its
Round

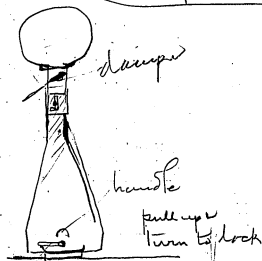


or its split like a
Victor Door



Possibly if we make double
flow must use floor 3
1/3rd at it —

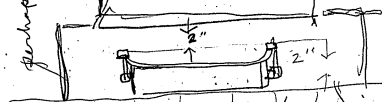
Also may have to put
filter Chamber heating
Coil on 5th floor if
Nehy has room or
3rd floor + blow up to
4th as well as 3 floor



or 2 legs 1 each side



Really think it can be
fixed



or enough get hands in

Caliper Varnish
plates —

See if grounding on
plate holder & also
on plates are all
the same & if they
fit —

See if press platens
Blank Transfer &
print Caliper
same thickness
all over — They
are flat but may
not Caliper same
thickness —

Condense Aniline then
with HCl deaerate out
free Aniline — then can
add phenol — Aniline
Cheaper & this process
gives definite phenol &
Known Resin —

Be sure by Expt
taking out transfer
at highest temp.
possible to stop
Cracks say
175 @ 180 if don't
puff up —

When plates are blown & even
if we then have trouble —
go for the Ovens,
uneven heats & condensation

Try the Double flow
Blow-bake, then
break Bubbles & Reflow
& final Bake —

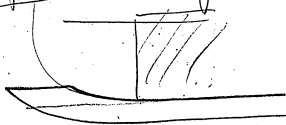
While Expanding & getting
ready for blowing
full scale try $1\frac{1}{4}$ $1\frac{1}{3}$
etc. move back to stop
Red Centers so we
can go ahead

See Walter Miller -
Galey - Cronkite, & his
Recording Man
Show last 15
Repeated records
& use Kathleen M
& fix it once for all
& say think he better
go back to old
funnels etc —

See about thermometers
see if correct by using
old ones -

Stop using new alcohol
in #12 blank

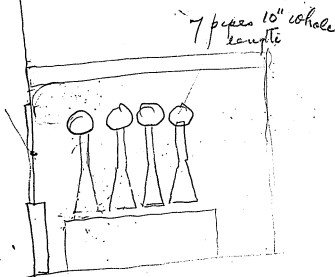
+ make dup Expt
Exactly as 9 made
to see what change
take out at 125
Print & Transfer -



See if any part of edge of
blank is on the curve
if so think we should
edge them small so they
cant occur, on the other

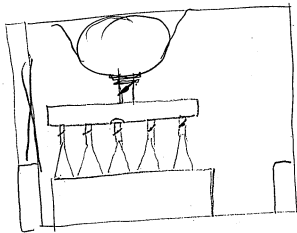
hard it may be an advantage
like the padded up Record model

perhaps the easiest way to put
blowing pipes up is this

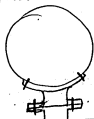


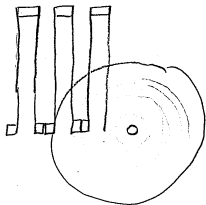
or

perhaps Spiral Weld Pipe
people have pipe in stock
or also fittings in stock

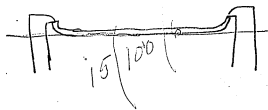


Can make casting for
fitting. Thus





$$125 - \left(\frac{1000}{1000} \right) \%$$



$$\begin{array}{r} 38 \\ 1200 \overline{) 400000} \quad (333- \\ \underline{36000} \\ 40000 \\ \underline{36000} \\ 40000 \\ \underline{36000} \\ 40000 \end{array}$$

$$\frac{90}{810} \%$$

$$\begin{array}{r} 333 \\ 1200 \overline{) 400000} \\ \underline{36000} \\ 40000 \\ \underline{36000} \\ 40000 \\ \underline{36000} \\ 40000 \end{array}$$

$$800\%$$

$$\begin{array}{r} 333 \\ 1200 \overline{) 400000} \\ \underline{36000} \\ 40000 \\ \underline{36000} \\ 40000 \\ \underline{36000} \\ 40000 \end{array}$$

$$\begin{array}{r} 38 \\ 30.4 \end{array}$$

Notebook Series -- Notebooks by Edison
Notebook, N-16-11-06.1

This notebook was used by Edison during the period November-December 1916. The first entry, entitled "Dinwiddie Expt.," lists twelve organic compounds with the notation "Sulfonate Calcium." Additional entries at the beginning of the book pertain to lamp black and other ingredients used in disc record manufacture and to problems with the use of lamp black in record blanks. Several groups of entries in the middle of the book relate to a series of chemical syntheses and separation experiments involving amino phenol, zinc, and "myrbane" (oil of mirbane, or nitrobenzene, used in the manufacture of anilines for textile dyeing.) Inserted into the book is a note by chemist Richard G. Berger, which contains instructions for the preparation of "brown P-Amino Phenol of Permanent Color from Black Product" and a chemical equation expressing one of the reactions involved. The front cover is labeled "Disc Record Dinwiddie Expts. 1916." The pages are unnumbered. Approximately 25 pages have been used.

Nov 6th 1916 -

Dimordic Expts

No 1 Methyl Benzyl aniline
Sulphonate of Calcium

2 Monoethyl aniline
Sulphonate Calcium

3 Ortho Nitro Anisool
Sulphonate Ca

4 = Diethyl aniline
Sulphonate Ca

5 Para Xylene
Sulphonate Ca

Nov 6 1916

6. Orthochloroaniline
Sulfonate Ca
7. Monoethyl-O-Chloro Toluidin
Sulfonate Ca.
8. Monoethyl-para Toluidin
Sulfonate Ca
9. Monochlorohydriin
Sulfonate Ca
10. O-Phenetidin
Sulfonate Ca

201
5
7
5
10

11 = Anisol
Sulfonate Ca

12 = Phenetal
Sulfonate Ca

We just found Coke particles
in our Lamp Black 2% -
German Lamp Black didn't
have it in - There particles
cut the soft Copper record
Matrix & scratches. Cracks
surface. found the soft
by levigating & pouring &
steepling the last part
was mottled with samples
people say it catches fire
black & then it makes the

Nov 25/16

Coke,

Wheels have great trouble
with the lamp work clothing
over grinder because of
Red dirt grinder

Have tried defeculating,

which won't go into water
without considerable beating
& stirring -

LB goes into acid like HCl
difficult, Easy

LB goes into alcohol also
Gasolene & Kerosene Easy

LB oxidized by KBrO₃ ^{but}
+ H₂SO₄ goes in best its
still lumpy & even after
washing well it res in
a hard lumpy condition
afterwards hard to get into
alcohol -

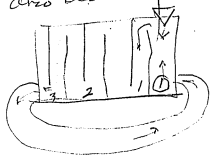
Oxidizing by KChlorate
+ HCl solution is the first
instance where the effect
and black is pronounced &
defeculation it so much
thick its almost Colloid -
Runn thru filter & then
filter. Chokes up & alcohol
scarcely get thru & then
alcohol is full of
single fine pieces -

Dont see how can wash out
the NaCl - it dries on filter
paper entirely different
from the others,

On a watch glass the
thin layer of LB by
transmilled light is
Red brown & translucent,

We are rigging up a
wheel water coated to
burn oil & make LB to scrape
off -

also blowing the 23



No 2 won ok recently a
sign of coke got -
now using it

Made a small $2\frac{1}{2} \times 5$ high mixer
with 4 arms & springs $1\frac{1}{2}$
long reaching out & bent
round to sides to whirl
& break up clots of
Lumpblack in bag has
works fairly good = $1\frac{1}{2}$
hours only few specks noticed
Think this can be made to
work fine -

Will now try & substitute
Kieselguhr for Lumpblack &
see how it covers on
blank - Could dye with Vermilion

11/26-16-

Today used reg blank Condensate Var
Var a Celluloid Submasker
blanks reg way looks
good, will print & test

Dec 24/16

Melted Shellac & added
Castor Oil - It
dont blend ng

Melted Rosin & added
Castor oil -
Blends OK
good

Base - ~~Para~~ Phenyl
~~Yac~~ Dried
from Chloroform
Not sol except trace in Kerosene

" Benzyl

Quite sol. Acetone Chills
out white, but Zinc

is in on burning -

May be something in it

Benzaldehyde dissolves

~~good~~ ^{enormous} - There is some Zinc

on burning but very little -

Think this is very good -

~~Is~~ Turpentine N G

Paralim Benzine - only a little
white -

Ether - trace -

Pyridine good solvent - nothing Chills out
very Red

Get some acetic Anhydride

If the Anhydride has been
any time in it —

So far only practical ones are
Acetone & Benzaldehyde —

Hydrochloric

Acetone dissolves it in
great amounts turns red
Can't chill out even a
concentrated solⁿ
Ethyl Combis — Alcohol
Can't chill out, turns
red —
Kerosene Gasoline Solvent
Naphtha Benzol Cassiafra
Carbon tetrachloride —
none Dissolve any

Bisulfite solⁿ of Benzaldehyde
(Don't dissolve much)
+ then treated with HCl
White leaflets of Amorphous
Come out immediately then
used fine to white

~~Benzadine~~

~~100 cc Benzadine~~

~~NO 2 Horizontal~~

~~started 7:50 am 11/9/16 done~~

~~at 4:50 pm Used 5 hours~~

~~to put Zinc in - used hot~~

~~water washing at times to~~

~~promote action~~

~~{ 10 gms Mydian
6 cc idl 60 ml
25 gms Kevadine
30 cc of 30% NaOH. formula
for each~~

~~in~~

~~NO 1~~

~~started 7:35 am - 11/9/16 done 4:30~~

~~5 hours put Zinc in 30 min~~

Benzadine -

No 1 Upright, double paddle
put

Started 7:50 am - done 4:50 pm
took 5 hours to put zinc in, 30 minutes
after zinc all in added 20 cc water
took 9 hours to make the run
had to put at times 60 hot water
when reaction got too cold

No 2 operated the same length
of time - This is horizontal pot
but in this case 40 cc of water
was added - This pot was smaller
& when ~~put~~ before put in water in
got thick & mushy & the
reflux tubes stopped up -
didn't have the trouble with

No 1 Double paddle machine

The yield of both was 54%
at the theoretical - but No 1
gave a light colored 2nd exposure
product whereas No 2 gave
Red cgo This shows

that NO 1 is best, apparently
during reaction it foams
terribly. I will measure the
charge & the empty space
to see how big a pot must
be used

The formula in each phase
was

10 grams Methylene

6 cc alcohol

25 grams Zinc dust

30 cc of a 30% NaOH sol

There is a very great amount
of ZnO formed which does not
dissolve in the soda &
this makes it very difficult
to filter. - We must
proportion our NaOH to
lessen it or we'll have

trouble. After filtering out
everything this ZnO didn't
appear to dissolve in NaOH.
30% or 20% even warm -

Another trouble is that
in using Warm boiling
alcohol to exhaust the
alcohol gets coated in
filtering & its practically
impossible to get it all
out,

In working by difference of
solubility the filtering
apparatus must be above
the boiling point of
the liquid -

There is some metallic Zinc
left - probably 20 @ 22 grams
would have done -

If all could have been got
we should probably have
got 60% yield of Chloroform

We only used 30 cc of 30% NaOH
Whereas it requires for 25 grams
Zinc to form Zincate, 102
grams of 30% NaOH.

No 1 Unrefined pot Double
paddle -

Depth - 4 inches

With 10⁴ m³ beam
259 Zinc
6 cc Alcohol
90 cc 30% NaOH,
40 cc water -

it made a depth of
2 $\frac{3}{4}$ leaving 1 $\frac{1}{2}$ clear
space for foaming

Previous run only used
30 cc NaOH 30% & 20 cc water
This dose used for measuring
had therefore 80 cc more
than 1st Run this will
show if foaming will
take place at 10 cc
and this change

Run 2

No 1 Pat,
10 gms Myxam
25 " Zinc
6 cc alcohol
90 cc 30% NaOH,
40 cc water after all Zinc

No 2 Pat same except only
60 cc of 30% NaOH,

Use hot water bath Cases
to keep warm so Zinc
dissolves

The No 1 Pat worked OK
Zinc pres & ZnO pres small
felled fine - will have
no trouble with this

No 2 more ZnO but not
very much more (than No 1)
Did not filter as cost
No 1 is preferable —

Yield No 1 $5.450 + 590$ from alcohol
Evap.
allowing for 3% bad Myxam 84.15% yield
from chlorides.
Yield No 2 $5.695 + 495$ from al.
X but in No 2 think the ZnO is in —
The remaining alcohol is being Evap which will
not still more.
We run $\frac{1}{2}$ hour after last Zinc
is in before pulling in
water —

84.15% yield from
Double Chloride Pat,
also same from the Horizontal

3rd Run NO1 Pat.

10 grams Myrbane
18 " Zinc
75 cc 30% NaOH
6 cc Alcohol

To be run hotter than before,
Zinc put in as usual same period
5 hours - Total 9 hours
30 cc water to be put in
after all Zinc is in -

NO2 Pat same except
only 15 grams Zinc -

3rd Run is OK

got 6870 white
at 493 light red

97% pure myrbane a lot slight
amount on working a precipitate
in the NaOH solution

This gives out better than 90%

The reason of high efficiency is
due to fact that I kept the
temp around 140°F over the
whole time - I put in the
water $\frac{1}{2}$ hour after Zinc
was all in -

We will now use for info

10 parts by weight Myrbane
18 " " Zinc dust
75 cc of 30% NaOH
6 cc Alcohol

9 Hour run - 5 hours to put Zinc in
5 $\frac{1}{2}$ @ 6 hours before 30 cc water
put in - Keep temperature
 140° Fahr throughout run

Anisophenol

The Red Solution from acting on base by KCl & reducing, by Ti as far as possible is still Red but light -

Shaking in separating funnel with

Gasalene NG

Benzol NG

Carbon tetrach NG

Amph. alcohol takes it out & "Amph." becomes deeply colored. Believ. most camphor got out this way - it leaves it light yellow, which may be something else -

Chloroform NG -

Benzaldehyde - NG acts out

Acetate Amph. separates but not near as good as camphor

Suspension NG

Phenol - good -

Parahydroxytol works pretty good & like camphor

Dichlorophenol NG

Ortho nitrophenol NG acts out

Methyl benzenesulfonate NG acts out

Hypon. Better than Amph -

Oil Sassafras NG

Camphor Oil NG

Isobutyryl alcohol NG

Eucalyptol ~~some~~ some but don't clean

Oil Lavender

Ketone Salicyl KO2 dissolves out black but colors oil probably impure more likely reduced -

Return Solvent No 2 from Newark
 Man is darkened by HCl dilute
 I have shaken it with some water
 & come off & separated it by
 funnel so as to distill it
 I distilled some got white
 but no more the HCl darkens it
 NA

Phenol seems better than
 Hypson but difficult to settle
 out phenol - tried to get
 to and it did not do it.

If shaken with some alcohol
 first & then shaken
 shaken with Hypson it
 becomes almost white
 but not more than phenol - try it
 Eventually 2 substances are

Big Tank -

For every $\frac{1}{4}$ inch 500 cc -

12 inches gave 24000,

100 cc Myrbane 100 cc

120 grams

3 gms Zinc dust to 1 cc

10 gms Myrbane	8.33 cc
75 cc 30% Soda	15 cc
6 cc Alcohol	6 cc
18 gms Zinc dust	6 cc
30 cc water	30 cc

1 unit 125.33 cc

Tank multiply 192 times

Forthes Pat.

1600	cc	Myxane
1152	cc	Alcohol
14400	cc	30% NaCl
3456	gms	Zinc dust,

Put 173 grams of Zinc in every
15 minutes, this will take
5 hours,

After all Zinc in acid 5760 cc
Water & run & lower acid
Altogether 9 hours -

Works OK, now red stuff -
Pot & proportions apparently
OK - am testing for yield
will plate Zinc out

On account of 31% attacking
the paper on filler also cloth

We used to sheet asbestos
pulling cloth over halves of
6" filler & then asbestos
sheet. This works OK -
asbestos has too short & weak
fibers to stand Vee but cloth
fixes it OK

We filler out 95% of the
strong collection material
diluting it =

This collection we will
handle out the line as 300
mesh dust by high density
up slow moving wheel
Rothco & Saper
This works OK on small
wheel -

[ITEMS(S) FOUND IN BOOK]

Nov. 23, 1916.

Preparation of Brown
p-Amino Phenol of Permanent
Color from Black Product.

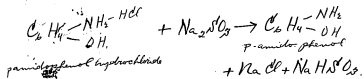
Dissolve black p-Amido-phenol in conc. HCl and boil. Decant of the clear solution and obtain the crude hydrochloride by chilling in ice-water. Filter, sucking the product dry as possible.

Dissolve the crude greyish black hydrochloride in a minimum of cold water. Filter. Add to the clear solution a saturated solution of sodium sulfite which has been made slightly acid towards phenolphthalein. This precipitates brown p-amino-phenol. Filter on a suction funnel and finally wash once or twice with a minimum of cold water. This final washing removes excess of sodium sulfite.

Substantive of Theo. & C. G. G.

[ITEMS(S) FOUND IN BOOK]

Reaction for the action of sodium
sulfite upon the hydrochloride is
represented by the following:



Notebook Series -- Notebooks by Edison
Notebook, N-17-01-20

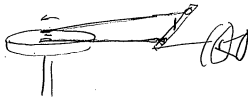
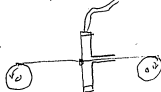
This notebook was used during January and February 1917. One additional notation is from August 1922. The entries, which are all by Edison, relate to research performed for the U.S. Navy during the World War I. The notes indicated as "entered . . . from small book" were copied from Pocket Notebook, PN-16-11-15.2. Included are experiments with electromotographs made with osmium (called "osmophones"), along with notes taken from published sources, many dealing with the photosensitivity of various chemicals. Additional entries pertain to reconnaissance methods involving light, sound, and radio waves. There are notes on night photography and night vision, including methods of keeping the pupils of rangefinder users dilated for more sensitive vision. Additional information on these night vision experiments can be found in N-17-02-06.1, Notebooks by Edison and Other Experimenters—Navy and Wartime Research Experiments. Also included are entries describing experiments with hydrogen gas detectors, methods of positioning guns in trenches, and techniques for disabling the periscopes of enemy submarines, along with speculations about "molecular vibrations." The cover is marked "Strategic" [Strategic]. The pages are unnumbered. Approximately 40 pages have been used.

Entered Jan'y 20/17 from small book

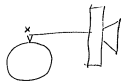
Pinacyanol + Dicyanin dyes, sensitizes
photo plates for red up to 7600 line



Balance friction pull on dia



Points in Osmophoria - Try Conducting
Silicon, Boron, Indium - (a) Boron -
also Carbonium + other Carbons
if they Conduct & are very hard



X Tellurium point, passage of. Current makes heat & slight fusion, stick a little & pulls dia -



X disc heated on this mica over this
another disc or square of metal.
connected to Besomphondia -
passing of an electric current
acts as a cathode & increases
friction. The mica should
be extremely thin -

Trench - funnel depth below
water level listen also use microphone
+ also record sounds on
phonograph + also 3 point recording
phone 500 ft + impracticable for precise

Make very sensitive Phonograph
002 dia. circular listening knife
+ very sensitive dia. large funnel
also reproduces 0017 light weight -
+ ear tubes to listen to record +
micro to note waves

Polished Copper plates - One
slightly oxidized in flame put
both in NaCl, on plate exposed
to light, other shielded, unoxidized
plate also works. One exposed
to light gradually turns red then
purple. - Even when plates are
contact with several coats
of white paint. Even defused
dunlight works 9.155 0.1 volt
Current 0.2 amp has been
obtained from a cell containing

2 plates 6" exp 1 oxidized the other
bright. See NY Elec Soc.
June 14 1916 12 pages -
TW Case

Diazo Compounds are very
sensitive to light which induces
phenolic decomposition.
Even when the action of hot water
or acids is slight.

Some Diazo salts are stable
at 0°C but decompose at 10°C.
These would give good photos for
radiant heat in presence of
something that would give a
color with the Diazo compound
or decomposition products.
See Chem Soc. Feb 1907-91-35
See Chem Industry 1890 9 1001
also for other exceptional decomposition
of Diazo Compound Ber 1874
7-1861 1884-17-274
1896-69-1327 1902-35-59
Chem Soc Trans 1896-69-1327
1902 81-77 1905-87-5
1906-89-19 Diazo are endothermic & highly
explosive

Dictionary of Applied Chem-
Vol 3 p 220

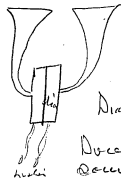
Diazotype Photography no
silver used

Prumline-Diazo Process Photography
by Cross & Bevan
Can get any color by using
different developers, no silver used

Bain Telegraph - Paraphenylenediamine
hydrochloride should be good

Wireless waves are reflected
by metal, pass thru insulators
probably can reflect waves
back from a vacuum.

Homatropine (Belladonna)
could be used by Ranger
finder men in low visibility
also areophane mas. but more open



turn -
when silence is strong
ahead

Diaphragm balance -

Direction finder for
sound

Could use microphone on Diaphragm
+ listen to that




Dogew magnets recovery
sharp powerful waves
~~from~~ Expansion + Contractions
of Core give powerful
waves to coils, powerful

make + break current with
Condenser + compressed air
If too sluggish use Electrostatic
attraction from strong wireless
want 100,000 per second

Send out the pale blue photogenic
waves of light in all directions



Reflector  Camera.

Have small guarding reflector
to prevent shining across the
arc. On dark night the pale
blue light generally distributed
will not be noticed if arc point
is guarded by using say
60 very powerful arc or big
reflector. There should be no
trouble in photog. at
Dreadnaught at several
miles away when a
person could not be
seen 200 ft.

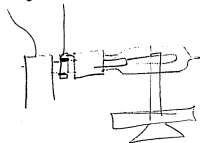
Tried this in Lab. 1-18-17
works OK

Send out in air pure sound
waves 12 per second &
get echo by a tuned
Resonator, & record on phone
& speed up to make audible -
or breaking up of long Echo
waves by vibrating diaphragm -
Could use Microphone
(these long waves are not)
be made into to energy -
or could use it under
water

For positioning big gun
in trench. Use air waves 2
positions & for 3rd use a
Diaphragm sounding board
against earth or rock in a
trench -

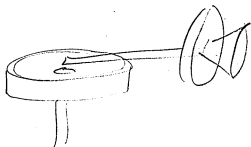
By studying with micro
the waves from large guns
its probable a Resonator
could be adjusted to the
most predominant period of
waves if any

In positioning a long pin
a die could be used very
insensitive to the small pins
one that is thicker & probably
weighted,



* friction Moteigh on Edison effect
Lamp - wireless

also spark linking, the incoming
waves vary the other waves



Desmophane using very thin discs
of different material -

Hydrogen Indicators -

Closed chamber & porous clay plug
put sub-marine air in under
say 3" water pressure & note
time it takes pressure to
equalize - use unglazed
ceramic. Dry air first then
air with diff % of H₂ -

Also time of loss of pressure
when air containing hydrogen
passes out thru a long
Capillary glass tube,

Pass gas thru a liquid from
Capillary tube - note size of
bubbles or number per minute
at constant pressure

Pass air into a glass with
KOH & pyrogallol drier
Open the drier & absorb the
O₂ - There will be N & H₂
left, what's left should
show on index excess of H₂.

Chamber = strip of Palladium
electrolytically heated below red -
Heat now let air in - if
Hydrogen it will be absorbed
& index will show gradually

Chamber -

Nitride forming substance
Electrically heated. This
removes O & N leaving
H to be read on index
using KOH for CO₂ - possibly
the O should be taken out
by KOH & pyrogallol before
Nitride is started,

Chamber having side tube
containing Chlorine, pass in
subm. air Open Cl tube &
illuminate,

Closed chamber - Pass in air
of boat. Use spark plug - if no
explosion allow H to pass in
till explosion occurs -

The Extra H is the measure of
Safety Or use current & Zinc
anode inside chamber. Ni Cathode
KOH Soln by measuring the amperage
You know just how much H there

Onomophori Sound waves
250 000 second phonograph
running very high speed
shutter breaking up into dots &
dashes - Reduce Speed of
Shutter to 4000 sec to hear
Echoes

Use $\frac{1}{8}$ dia bullet & give it a
rotation so its equivalent to $\frac{1}{4}$ "
This indicates the amount of
ammunition necessary to
Carry

Belladonna, makes the eye
exceedingly sensitive to light
In day time eye is very
insensitive to make it more
sensitive the nerves which
control accommodation
must be paralyzed -
Hence when one is in dark

room for some time & the
pupil is dilated; if Homatropine
is put in the eye the nerves are
paralyzed & the pupil remains
dilated even in bright light,

If one is in bright light &
there is a haze comes up or
evening approaches, the
eye ~~for~~ does not become
adustious only slightly -
Therefore in Naval work
Range finder, men should
work in shifts & stay in
dark rooms using
Homatropine to dilate &
keep dilated the pupil of
the eye when going on
duty = in this case
Less visibility is very little
hindrance for account
of more than making up
the loss by the enormously
enhanced near vision
of the eye
Homatropine can be used

was going to use Pilocarpine but
eventually Homatropin the active principle is better

any number of times by
those under 30 yrs of age
afternoon glaucoma

Should not be used on any eye
until tension taken before
hand
Continuous use sometimes
results in inflammation of
the Conjunctiva

Homatropin & Cocaine discs
1/50 each would be what
is wanted - effect can
be counteracted by 1/2% of
Eserine. This acts as a
myotic - Dilatation
requires one hour for
maximum effect, accommodation
restored in few hours by
using the Eserine

Robt G Reese MD 50 W 52nd St
where I got information as to
time of dilatation using cocaine

Absorption of light from an
arc light in atmosphere
is 10% of the whole per
Kilometre

Sees light vision confused as
to detail but more sensitive
Make special case —

I wonder if after eye has been
in darkness for 2 or 3 hours &
head recorded exactly as head &
a rotating shutter if the pupil
will stay dilated so as to
see better at a long distance
than if no head of eye
Contributed,

Any disturbance of the internal vibration
of a molecule causes waves to be sent
out into space on the ether.

Heating sends out heat waves -
light light waves -

Should think an electric stress
should send out X & γ waves to space -
Magnetic stresses - other waves still
Chemical action still others

(That is wanted is a line of instruments
to detect such waves & make them
appreciable to one of our
five senses -

In addition to the ether of space
there may be a far more attenuated
gas than hydrogen in our atmosphere
Extending far beyond our irregular
 N_2 , O_2 atoms perhaps going
out millions of miles. This
having a pressure independent
of our air atmosphere & nothing
to do with the ether & not taking
part in any transmission of energy
at 186,000 miles per sec. - Sound waves
of 200,000 per sec or greater might

go on the lighter gas, but
a million per second would be
better perhaps these waves
could be obtained by disturbing
crystals, or double salts, or very
complex molecules by electric
discharging them using spark gap

I think that when a steamer
or submarine is in motion
that the hull is vibrated strongly
by the engine driving or electric
motor around & that hull
acts as a sounding board
to give the waves to the
water. I think could take a
record on phonograph & determine
character of the sound by looking
at waves recorded on the
phonograph.

Sound attracts & repels light bodies
in a Resonator vibrating at
the mouth repels a light disc
100,000 per second may give result.

If the internal vibration of a molecule
is the source of the vibration of light
a body, then probably the lowest
rate will not be less than 250
Million Million per second,
between this & sound is a wide
gap — If we want to get
vibrations an entirely new series
to fill this gap we must
have doublets or Complexes
The Complex should give out
a very much slower rate vibration
~~as compared to the~~ These would
give the frequent & light vibrations
but superimposed on these would
be the vibration of the Complex
What kind of an instrument
will detect the superimposed
vibration of the Complex or
the Crystal perhaps the darkening
of photoplates thin opaque screens ducts
these

Brushes make a lens for
reflecting spy glass

Illuminated Chlorin loses its
activity in $\frac{1}{1600}$ of a second

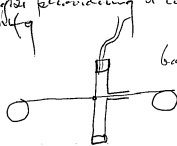
Plotron Oscillator 50 Million
Waves a second = Hat Cathode
lites - 9 feet Elec Res. cond
19 771 (1916)

Ultra Violet light dechlorifies
chlorinated surfaces -

Should try most sensitive
Balmain's phosphorescent
paint on glass exposed in camera
Then load on dry photo plate
+ let it ~~expose~~ itself, then develop
think can get rapid work in very
low light this way

The Holograph principle either with
 phone & vibrating shutter or use
 of mirror & piezoelectric surface
 is going to lead to big results
 All great energy changes &
 modifications of matter of all
 kinds & all wave motion take
 place at junctions or surfaces &
 these surfaces will be so modified
 that there is bound to be an
 alteration in the frequency

Why not make a dry photo
 plate consisting of a mix
 of powdered reducing agent
 like Pyromellitic acid or
 hydrochloric acid with the gelatin
 & thus providing it with reducing
 in H₂O



balance

Made by
 1921

Action of light on Chemicals
always tends to produce compounds
which have a greater electrical
conductivity - by using a
Wheatstone bridge & light could
be able to get some very sensitive
effects from light etc -
J Gibson Zeit physikal Chem
1897-23 349

Phosphorescent Strontium Sulfide

Chem Soc Abstracts 1897
p 430 + also 469

With a mix of 2 hydrogen &
1 oxygen Barium Oxide at
280° Cent causes all the gas
to disappear. The Oxygen
combines with the BaO to
form Ba Peroxide & then the
Hydrogen reduces it forming
water 250° C lowest temp KOH
acts same way at 280° @ 300° dec in

Glass vessels Compt Rendu -
1897, 125 271-275 -
Wonder if only trace of H₂ will it
act if so good for Submarines

Action of light on large granules
of Cholesteral - Max Roloff -
Zeit physikal Chem - 1898
26 - 337-361 -

By getting 300 or 400 mesh
fluorescent particles put on
surface of a fast photograph
plate with a pyrex particles
to fill up the spaces between
these particles. We should get a
very fast plate in weak light
on the accumulative principle
Developing after phosphorescence
has died out - Can get salts to
fluoresce in all parts of the
spectrum - This should give outlines
of starlight in very low visibility

A Rigollat Compt Rendu - 1895
121 164-166 - Action of infra red
on silver sulfide. Uses Ag plates
sulfurized by current, in dilute
Zincum Sulfide (plate 40 mm
long 2 mm wide)
Can be traced for course down 60c
distance below Vis. C. red -
Max EMF 0.003 to 0.004 V
Illuminated plate always negative
no matter what solution used -
Heat has very little action, but some

Luminosity of pure Organic
Compounds - Wiedemann &
Gerhard Z. physikal. Chem
1895 18. 529 552

Adolphe Besson Compt Rendu
121-125-126, Chlorinated
hydrocarbons in presence of
Oxygen decomposed by light
giving acids etc

Electrode sensitive to light
H Luggin—Zeit physikal. Chem
14-395-398, says most sensitive
yst. plates coated with Bromide
of silver paired with a similar
coated silver plate in Decinormal
solution of KBr - if defused
daylight gives 0.4 Volt,

L De Vries Rec Trav Chim 1901
20-435 456-

Ba Sulfide purged out phosphoresce
if 2 atoms of Barium to
100000 of Ba Sulfide is mixed
at ordinary temp it will phosphoresce
for 1 month after exposure to light
at low temp phosphorescence not so
good but it remains for a longer
period while at a higher temp
the reverse is the case

P Vignon - Compt Rendu 1902
1341 - 902-904 - Vapors emitted by
Zinc are capable of acting on
a photo plate -

Mayer Wilderman Proc Roy Soc
1902-70-66-74 effect of
light on $\text{CO} + \text{Cl}_2$ etc accurate
measurements.

Raikow - Chem Zeit

Action of light on sublimed
Chemical - Benzoin acid
Naphthalin Indane Camphor
Sublimed stuff always attracted
+ goes to illuminated side of
the vessel.

Kislakowsky Zeit physikal Chem
1900 35-4311-439
 H_2O_2 having a few drops of ferrous
sulfate 1% H_2O_2 in dark very little
decomp - but when exposed to light
decomposition very great.

Dubois - Compt Rendu 1901

132-431-432. Many organic
Compounds when combined with
Alcoholic Potash give a solution
which are luminous in the dark
& in some cases at ordinary Temp
Essence Rosemary, Cumin, Camomile
Best results with Aesculin

This glucoside gives a solution
which remains luminous
during a whole night
luminosity increases when shaken
allowing air to get at it,
fluorescence destroyed by adding
Water to alcoholic solution
All these results are weaker
than with Marine Bacteria

Oscar Gros = Zeit physikal. Chem
1901-37-157-192.

Leuco bases of a number of
Colored derivatives of triphenylmethane
are sensitive to light, darkening
most rapidly under rose colored
glass, addition of salts
generally increase sensitiveness
Bleaching of dyes themselves
investigated - a long paper

Tschuquaff - Ber 1901 34 1820 1825

Triphenylmethane
Crystalline substances - luminous
when rubbed or struck
See Wiedemann & Arnold. [11] 34
446. Tried 500 organic substances
Uranium Nitrate strongest
Quinine Valerate, Cocaine
Salicylate, Cinchonamine,
Coumarin + Aniline Hydrochloride
Luminosity ceases when force
stops except with Acetanilide &
Sulphanilic acid -

Otto Ruff + Victor Stein-
Ber 1901-34-1668-1684
Sensitive of Diazo compounds
to light.

Murillo - Compt Rendu, 1898 127
372-374

Intensely phosphorescent
Strontium sulfide -
100 grms Carb Strontia
2 grms Bismuth subnitrate
2 " Sodium Carbonate
0.12 " NaCl

after moistening the soda salt
with the Sodium Salts heat to
redness - then mix 21 grms
Sulphur + the Bismuth salt
Heat to bright red for 4 hours
It is relatively stable,

Mowall - Compt Reule 1899
128 557-559 -

Strontium sulfide shows a more intense & persistent phosphorescence when excited by diffused daylight than when exposed to direct sun light. Ca Ba & Zn

sulfides, show the same peculiarity. Exposure of Sr Sulfide to diffused light makes it more sensitive to subsequent exposure, - whereas exposure to direct sunlight reduces luminescence & may destroy it all together.

Repeatedly exposing Sr Sulfide for short time to diffused daylight it becomes so sensitive that

marked phosphorescence is excited by light from one candle.

It also shows intense phosphorescence when heated considerably below red heat.

One phosphorescing Sr Sulfide will start another Sr phosphorescing.

Infra red can be seen in Spectroscopes
up to 8000 by concentrating the
light on a slit & filtering out
the luminous rays by Solphur in
 CS_2

With mixture of Hydrogen &
Chlorine: it must not be exposed
to light for an instant, if it is
then the H & Cl will combine even
in the dark increasing the
temp enormously increases the
sensitivity of Comp. acids
acted on by light,

Becquerel studied Infra Red
up to 14700. by producing
infra red on a phosphorus
screen, Compt Rendu
96.

Abney - Proc Royal Soc 35
80-91 - no ray beyond
8330 can be photographed
when air is filled with moisture

Dio-ferrie Oxalate is sol
in water & very sensitive to
light.

Aquous Ferric Chloride in
presence of Oxalic Citric
Tartaric, Salter, Argemone, oxalic
is reduced slowly by light.

Ammonium Bromide is
somewhat decomposed by light
it turns yellow & there is
free hydrobromic acid &
free Bromine -

Bromide of silver plate is
most sensitive to pale blue
450 wave length rapidly
diminishing with wave

Sulphides of Ca Ba Sr &
Blende, are most sensitive to
rays more refrangible than
F while Aluminum &
Iceland Spar between D & F

Iodide Potash if treated with a
small amount of HCl in diffused
daylight not sufficient to color
it will when in full light
turn yellow from free iodine

Mercurous Selenate $Hg_2 SeO_4$
grayish white amorphous
Substances obtained by adding
Selenic acid or an alkaline
Selenate to Mercurous Nitrate
Very rapidly darkens when
exposed even to diffused daylight

D. Macrogammonium Selenate.
obtained by treating neutral
Macrosic Selenate with strong
ammonia & detaching the Salty (or
White Compound)
Darkens when exposed to light.

Mercuric Selenocyanate obtained by
adding Potassium Selenocyanate
to Mercuric Acetate; darkens
on exposure to light.

Wonder how Silver Salts would
work.

Light acts on Cadmium yellow

J+P Curie, Compt Rendu 91
294-295

Development of electric
polarity by pressure in Hemihedral
Crystals with inclined faces.
Pyroelectric Crystals by pressure
gives same effect as with heat.

Polars, Sodium Chloride, Bernoulli
Tourmaline, Quartz, Calcimine
Sapag, Electro-Tourmaline, and
Sugar & Seignette Salt.

Whenever a non conducting
hemihedral crystal with
inclined faces suffers

Contraction electric polarity
is developed. Whenever it is
dilated Elec is also developed
but reversed.

Probably on heat + cold as with
my old experiment of bending
hard rubber when in contact
with lips, giving heat + cold
sensation.

Ethyleinchonidine obtained by
treating Cinchonidine Ethiodide
with ~~fresh~~ solution - gives
transparent needle spunkies
become red on exposure to light.
M Claus & Danerbaum Ber 13
2187-2191 other things in same
article sensitive to light.
also see Ber 13- 2290-2294

Kahlbaum Ber 13 2348-2351

Methyl Acrylate Light slowly
changes it to a transparent
gelatinous modification.

R Fittig - Annalen 206 -34-67

Isotropic Acid - Allylene
sulphonic Acid + also the Bromine
Salt Very sensitive to light.

Honey Proc Ray Soc 27 291-451

AgBr is not sensitive below 13
when exposed under
Radium sulfate sensitive to
M (about wave length 12000)
the lowest limit yet photographed
Infra Red is very oxidizing -

Jorgensen. Jpr Chem (2) 20 105-

Chloropurpureo-Chromium
Chloride red crystalline
powder dissolves in 154
parts of water to a violet
red solution depositing
chromium hydrate when
exposed to light

Photo Cell. Kung J Franklin Inst
182-693-4-1916 200

perhaps its not the silver that gives the
images in a photo, but the formation of
an oxidizing compound by the action of
light + on heating with pyrogallic
or Metal paramedophsenal or
para-phenylenediamine oxidizes these
reducing agents to black
Can test with Electric Current
+ prove it - Should think
reducing aqt could be
put right in the plate emulsion
& it would oxidize + give
a picture right away

Possibly no silver at all is
required but chemicals which
acted up by light are oxidized or
produce an oxidizing action & if
para-phenylenediamine or other reducing
agent is present will give a picture
directly + perhaps instantly
so development not necessary
hence can act as a dev of film
by having exp piece connected
to Current

Pale blue light buoys at sea

Telephone Cable Way out at
sea. Tapped at Center leading
to Shoring sound funnels
Connected to ~~transmitter~~ Microphone
transmitter - Oper on shore
Can tell when ship passes
over - Each section
15 miles Enchanted Center -

Fry Charles Friends Clay
in oil sundage for periscope -

Perhaps humus dissolved in
ammonium + mixed with
Straw oil well for a good
periscope Sundage

If sweet mica ground in seep
a way as leaves are separated
+ mixed with oil it would

probably smudge the
landscape & destroy all
definition although light
could be seen through smudge
but it would also be reflected
for shading the surface of
the sea as it is a good
reflector of light. The
smudge or smog
could be seen even at
a very much greater distance.

Smudge - Chemical ground
to impalpable -
Bone black, phosphate dissolved
out by acid -

China clay

Brick Common along with oil -
not -

Russell's

Vulcanite -

Resin & Tallow - little mixed
with humus -

Paper pulp ground fine & boiled in oil -

Feb 11/17
All experiments with hydrogen-carbon

Smudging Penscopes,

Straw oil, with coal tar put in a (heated) colors deep yellow but only small % discolored but enough to do the biz -

Kerosene alone with glitters in it heated spreads good but film too thin to obscure much

Straw oil + Texas Asphaltic oil heated colors strong and fine straw in. dirt break when wet glass rubbed in. Smudges OK - US Asphaltic Ref Co 12 Bx Panuco Dist

Straw oil + Oleic acid, breaks away

Straw oil + 60 mesh ground asbestos sinks -

Hot straw oil + Prime Cuban asphalt works pretty well, almost good enough no break with wet glass, smudge good. Glitters instead not quite so good. Mixing Kerosene with this mix don't improve it.

Confetti from old newspapers (oiled in oil - $\frac{1}{4}$ inch - or smaller oiled & confetti blown on sea -

Think best way to peel oil on sea ~~is~~ is with big spray guns -

Oil mixed with kerosene oil its oxidation would keep it slowly after spraying -

Straw oil + French Talc, this work fair but irregular -

Straw oil + Rotten stone pretty fair

" China clay only fair
" Lampblack breaks with wet glass
" Kieselguhr don't stick to glass
" Gudebrand asphalt works

pretty good

BS in straw oil don't color enough

It looks as if straw oil + asphalt will do the trick -

Notebook Series -- Notebooks by Edison
Notebook, N-17-02-14

This notebook was used by Edison in February and March 1917 to record research performed for the U.S. Navy during World War I. This work was probably done in connection with Edison's attempts at aiding submarine detection. The notes describe a series of experiments, numbered from 1 to 51, aimed at amplifying sound. Included are descriptions of the equipment used and of various arrangements of apparatus at the laboratory. Most of the experiments involve attempts to amplify and measure the sound of a phonograph playing a continuous note within a soundproof box. The box was equipped with different transmitting devices, most of which employed audions in circuits with induction coils and condensers. The transmitters were connected to telephone receivers. Edison's notes indicate that he was assisted at times by Miller Reese Hutchison, Absalom M. Kennedy, and other laboratory employees. Notes by Kennedy on related experiments can be found in N-Undated.6 and N-17-03-06, Notebooks by Other Experimenters—Navy and World War I Experiments. The pages are unnumbered. Approximately 40 pages have been used.

Feb 14 -

#30 phono facing 2 flat Bell Receivers
in series - $1/16$ away from grid -

also same in Multiple -

Series is louder than Multiple -

Series 50% louder than single - Hitch

2nd Expt

One receiver 1 ft from grid

Kennedy hears at 30 notch

3rd

ditto same as 2 but 6 ft from
grid 28- This is queer, probably
spots in record create loud
with Tuning Record 435 vibrations
second 90 to 8 only Kennedy

Measuring box



Shunt line +
adds Res also

Numbers are miles of 19 wires

2-14/17
4th Experiment
With tuned record 6 ft. 2 in
series, 12 points I

2

5th Experiment

When in series 6 ft away
but bucking each other
get 6 points = Only - probably
magnets unequal as was
shouldn't hear busy thing -

6th -

2 = Now Multiple arc - get 10 points

7th

with 3 in series get 14 points

8th — 2/4-17

3 in series — 6 ft away

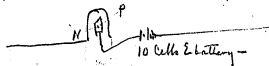
put in E Valve lamp in line —



Can't hear anything.

9th.

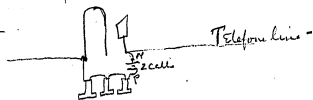
3 in series 6 ft away #30 phone
perman room — turning Revers



Can't hear anything

#10

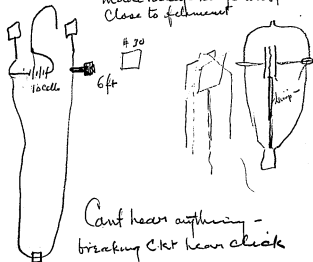
2-14-17



hears to 8 - but this is going
without Valves

#11

This is a new lamp Howell
made today - large with platin
close to filament

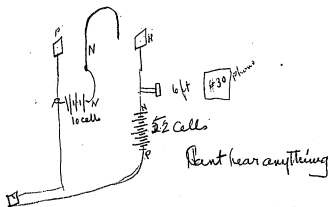


over Receiv
only

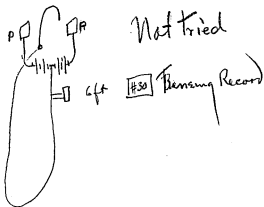
Can't hear anything -
breaking Ckt hear click

July 14/17

#12



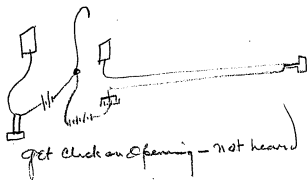
N073



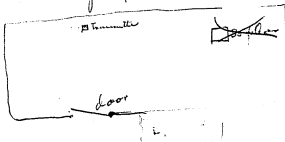
Foxboro Co - ~~75~~ 50 Church
at NY -

gives correct horizontal
progression of angle of
wings are not more
than 14° - from horizontal
would be slight
Error if up to 20° deg

#14



Experiments with angle groove call
Openers.



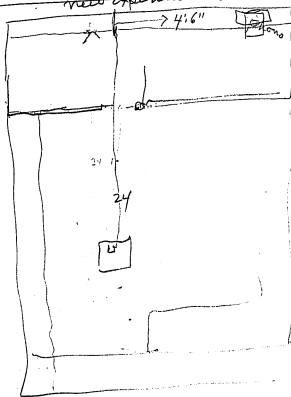
at Receiver End - heard 16 on box
door 2" opening -

this

2/18-17

$\frac{1}{2}$ " opening leave nothing
with door 1" opening hear at 10

new experiment



Photograph showing lining record

1st Expt Door wide open
Licht on box (14) — 3 cells on
High Res coil on transmitter primary
outside —

2nd Expt

Door $\frac{1}{2}$ closed
Stops at 8.

Door 2" opening Stops at 4 on box

While it is raining & everything
stopped & working on top of C. for
yet Kennedy is gathered by
Confused Noise. Coming from
without some probably coming
for $\frac{1}{2}$ mile away the air
being filled

I have just finished

Used in 1st to.

A Bell before induction coil

Res Primary ———

" Secondary ———

Transmitter in secondary with
3 cells =

Will mark Coil # 1

Coil No 2 $\frac{1}{2}$ " spark coil —

a round piece of Box -
one box within another
with $1\frac{1}{2}$ " Cow hair between
& will try last experiment
listening in this booth,

3rd Experiment ^{now} in booth.

Door 2" opening varies from
6 to 8 points on Box

4th Experiment same as 3
but door 1" with opening -
get it only at intervals other,
sound then before intervals

5th
Same as 4th but with # 2 Coil
trifle better - 2 points on box

#3 Coil

Res primary

" Secondary

#4 Coil -

Res Primary

" Secondary

#5 Coil

Primary

Secondary

6th Sept Coil #3.

Get 12 points on box
If conditions not changed this is
good coil for the transmitter or
receiver

7th Sept - No 4 Coil got only audible
noise no note from tuning
record,

8th Sept #5 Coil - no recording

9th Sept 6 Coil just hear it at 2

706 Coil

Primary
Secondary

#7 - West Elec circular Coil -
get at 24 points

Think this is very high
Secondary Best yet,

Res Primary
Secondary

8. Westn Elec

9 Westn Elec

10th get, 7 Coil hear at 24 point
on box - best yet **BOSS!**

11th get #8 Coil Westn Elec
hear at 16 point.

12 #9 - 6th point.

13th get 10 hear on 2

14th = Both not perfect Fredone & I
25ft away was heard in both
& interfered with test -
Will put Cow hear outside -
tested #7 only got 12, while
~~for~~ we were talking

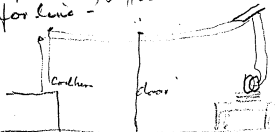
15th Firestone gone, quiet in room
#4 Coil - get, found slight frying
think this due to some gas or
air wave we can't hear
tried it again but fries like a long
Contact = OK now was a bad
Contact, get 23, This corresponds
to ~~front~~ 10th input where was
get 24 —

16 - #4 coil but 4 calls but
now - having added
one more call - still
using tuning record on
30 phono & same conditions

Door 1st open
get, 25 but shaky



heavy light wires laying on floor
was connected to microphones
probably jans went to it
Have now #36 Catlon covered
for line -



This fine wire rigidly suspended
above to microphone will
prevent any air wave being
transmitted

An important thing about very
sensitive Microphones is that
great precautions must be
taken to get a holding stand
so no vibrations long at short
can shake it.

NOTE

7 Cid

7 Cid -

17 Experiment instead 4 cells
used 3 got 10 points.
Kennedy is bothered by sounds
coming from window —
Street cars passing etc
which interferes in hearing
the continuous note from
the phonograph —

18th Experiment same conditions as
17 but 5 cells alkaline cells
put on — got 23 points —
after 18 points —
Change the 5 cells don't do
better than 4 —

7 Coil

19 =

We now try 2 receivers to the
Ear instead of 1 got 18 points
no difference. Receivers in
Series -

20 = We now connect receivers
in multiple arc. got 20.

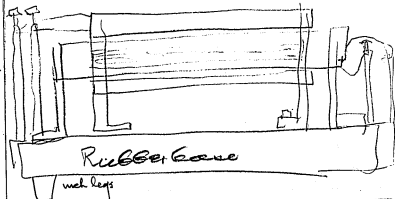
21 = Talking 12 ft away from
booth standing up in my
ordinary tone of voice
Kennedy Can hear it
but not when sitting at
my desk = Well improve
booth -

Wanted from Bunnell —
Primaries

2 each 1-2-3-5-7
2 of 10-15-25

Secondaries —

1 2800
2 2000
2 1500
1 1000
2 750
1 500
2 300
2 200
2 100
2 50



Measured resolution of primary
+ secondary

got points on box

No	Primary	Secondary	
1	.57	93	2
2	.03	4500	12
3	.45	158	0
4	.42		0
5	.38	33	2
6	.063	151	24
7	34.5	228	16
8	56.5	177	6
9	41.6	40.6	2
10	136	14290	
11	.906	39.7	
12	.88	38	

Expt 22 - #11 Coil -

Expt 23 17 Coil -

Expt 24

Have changed things to the better
Main line to Booth on glass
insulation -

Booth coated outside & in with
 $1\frac{1}{2}$ Cow hair double door
Kennedy supports Oh ~~but~~
except very loudest sounds

The Audion as batteries
on insulation -

The Microphone is in a case
surrounded with $\frac{1}{2}$ "
Cow hair & suspended
by catgut wires to bellow
above resting on one
inch of Cow hair -
Soft Rubber legs

The phonograph is in a chest
lined with Carob-hair $1\frac{1}{2}$
has lid which clamps
tight on to Carob-hair.
Has opening in front
with Camera Lens shutter

first test 25th = still got a
continuous note about 120 sec
phone going or stopped

Then perceptibly from light,
line. Have ~~some~~ calibration
in + Bell Recr as transmitter

Lens shutter wide open -
Phone 18" from shutter

got 30 points, changed to
2 ft. got at 30 yet, dia $\frac{1}{2}$ open
got it at 20 points - Bell receiver

6 ft away. Lais wide open
28 points.

Lais. 2 position	26 pounds on box
4 "	22
6 "	22
8 "	20
10	18
12	18
14	16
16*	18

* 16 is as close as possible

Lais closed to only 16 in -
~~Open~~ and suffering at
full of Lais hear hear at 12 points
on box

We now connect the Micro
in next room, to the phone, which is
plugged - using Anderson on line -
No induction coil - Poor
wide open get 30 points but lots
other sounds - * using 4 cells
Kennedy left the induction coil
out by mistake, the heavy current

May have turned the Micro Gallo

We now put in #7 Coil secondary
to Micro 4 running to line -

get 30 points with door one
inch open which is best yet,

get 30 points with door $\frac{1}{2}$ " open
with door closed get 30 still

Kennedy with ear near
Micro can just hear phone
in other room -

What we want is for Micro
to detect it when the ear hears
nothing. -

We now put 2 boxes in
series get 42 points -

In all cases there seems to be
some frying at times strong this
must be got out to avoid at all -

This is the point now to work on

Phenomenon - when in bath
we touch ~~the~~ one of the boundary
facts on the Box phone rings -
Must get this out -

I have just found frying continually
due to gas from building given
by Street Cars way off &
other things - The 6. felar
Suspension is no
lard Meers on the Haldor
on 2 thicknesses (and)
hair - These reductions

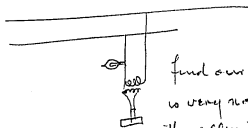
frying - then put around
itself on 3 layers hair
this was better still -
I myself can hear the
fry now under these
conditions -

If main line is opened
we get it - if both ends
receiving phone is disconnected
don't hear it -

If everything connected
+ transmitter cut
out still get it
if transmitter cut
in 40% louder

This refers to steamy, heavy
sounds - not the 120 sec
dynamics sounds which
all pre-aching -

get it even when audio
disconnected -

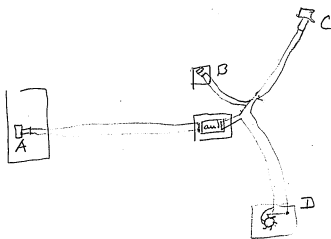


find our light line
is very narrow hear

the accompanying channel

note strong - this note 100 hear has
experimental and class line - 2 hours

But 100 have for in addition
so far Cant find it.



- A open
 B open
 C closed
 D Running - hear it tick

(1)

- A open
 B open
 C closed
 D stopped, closed - only Diggins -

(2)

- A open
 B closed
 C open
 D Running - get louder & intermittent chirp -

В close

с 8-го

D stop

A skin

$$A \in C_0$$

C. *ad.*

500

B on

Don't

A 5th

B C

20

D.R.

1000

عبدالله بن
محمود

c. clo.

D. Rev

medium noise - no chirp -

A open
C closed
B open
D Running medium current no chirp

A open
C open
B closed
D Running - medium current no chirp

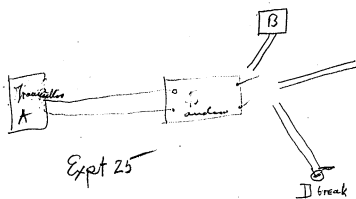
Audio + 6 alternators
on table - not insulated

A closed telephone out,
C open
B closed
D Running - medium sound no chirp

A closed telephone in
C open
B closed
D Running medium sound no chirp

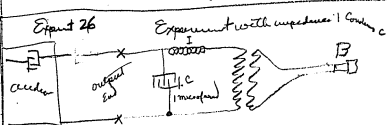
A closed with telephone in
B closed
C open Liberty ground off
D Running - Chirps Bad

A closed telephone in
B closed
C open
D Running Liberty ground in no chirp
but medium sound - with another
ground on No 1 plug of 2nd antenna
at corresponding wire on #1 antenna
medium disappears - but 15
miles shows on galvanometer
when both ground on -



Expt 25

A connected
B " " | Box 38 Noisy - dynamic only
Bell phone playing to
Bell phone -



phono playing

I have 177 ohms Res - 6000 ohms impedance

Box 16 points - very quiet

Expt 27
Same condition as Expt 26
Except impedance reduced from
6000 to 2000, Condenser same (12)
1 Microfarad
Box - 26 -

Expt 28 -
Same as 26 but 2000 impedance
+ 1/10 Microfarad Condenser -
Box shows - 32

Expt 29 - WE keep conditions of
28 same stop the phonograph & cut in
II break wheel -

The wheel sound is reduced
20% - ~~if~~ or if medium waves
100 this is 80%

Experiment 39 same as 28
but with break wheel in + change
from $\frac{1}{10}$ M.F. to $\frac{1}{2}$ microfarad.
This is now 50% -

Experiment 40 -
~~Phonograph~~ running wheel out.
2000 impedence $\frac{1}{2}$ microfarad
Box - 28 -

Experiment 41 -
Phonograph running break wheel
out, $\frac{1}{2}$ microfarad
Impedence - reduced to
1000 impedence =
Box 28 -

Expt 42 -

through running wheel out
No impedance | increased
working -

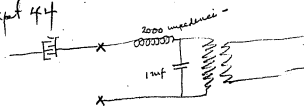
Box - 38 @ 40 -

Expt 43 -

We now try break wheel out
w with 42 conditions -

35 @ 40% of medium -

Expt 44

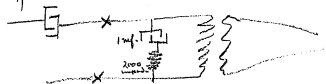


through running break wheel out.

Box 30 - little noisy

Expt 45 We now test break wheel
noise 60% -

Expt 46 -



We test break wheel on this -
70% -

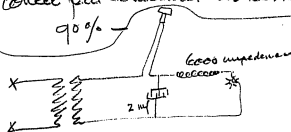
Expt 47

Regular at both ends, break
wheel in but shunted by
1 mf. Condenser -
Very bad noise - over 130%

48

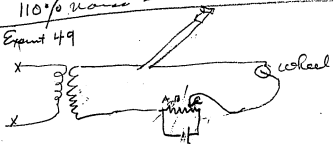
We now instead of shunting wheel put Condenser in series -

90% -



110% noise -

Expt 49

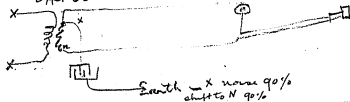


Bill phone cut out
other room -

gets louder as go from A toward C

Reversing just the same

Expt 50



Earth - X noise 90%
shifts N 90%

Expt 51

Fig. X



3

Motor

Close circuit + Throw belt off Reap
Motor running - perhaps waves induced
in by Motor with closed circuit,
No sound of Motor stopped or
Started - yet heard sounds -
as usual -

March 9 - Eve

Old 1st Microphone - on table in
Midway room - on lead -
Thorough in Cochran Cox - 5/8 hake
door closed - Primary input
output coils on - 3 cells -
get 30 on Cox - In put coil
primary 11 chms -

WE expect at 250 primary
for 11 chms primary on
input coil -

1st trial don't get as well, noises
come in somewhere - 2nd trial
don't get anything appreciably too
constant, something wrong

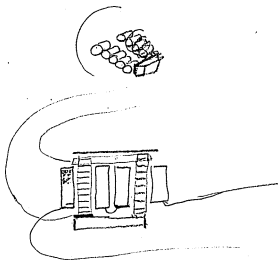
WE put the 11 chms primary
back - something wrong

WE evidently short circuited
the 3 cells thru microphone
& burned it -

**Notebook Series -- Notebooks by Edison
Notebook, N-17-02-22**

This notebook was used by Edison in February 1917 to record work for the U.S. Navy during World War I. Included are circuit diagrams and drawings relating to the recording, amplification, and measurement of sound. The pages are unnumbered. Only 16 pages have been used.

Feb 22/17



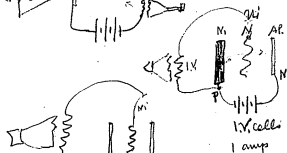
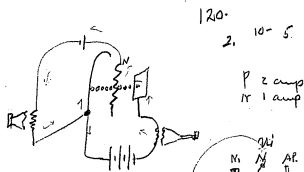
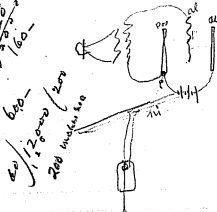
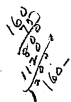
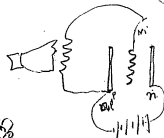
850000-

$$\begin{array}{r} 280 \\ 3 \overline{) 840} \\ \underline{84} \\ 0 \end{array}$$

$$\begin{array}{r} 1000 \\ 5000 \\ \hline 5000,0000 \\ \hline 30667000 \end{array}$$

3.

$$\begin{array}{r} 250000 \\ 84000 \overline{) 250000} \\ \underline{166000} \\ 121000 \\ \underline{84000} \\ 37000 \end{array} \quad \begin{array}{r} 138 \\ 52 \overline{) 138} \\ \underline{104} \\ 34 \end{array}$$


$$1 \quad 7 \int 60$$


200-1200/200
200-1200/200

135 100 cells -

4 amp -

16 / 4000 (250 - hour
 $\frac{3\frac{1}{2}}{8}$

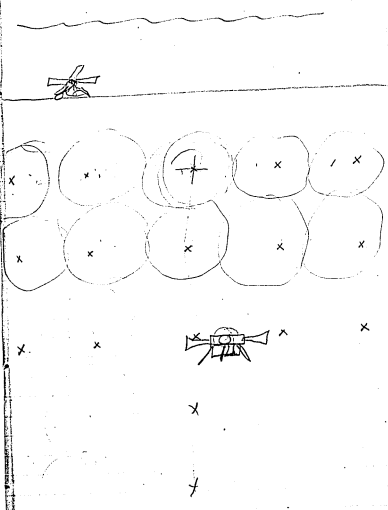
50 x 50

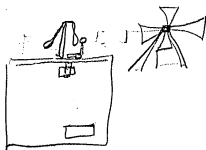
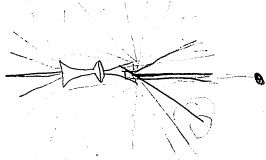
24 / 250 (10-
 $\frac{2\frac{1}{2}}{1}$

4-

12 - 1 minute
150 1 yr

1000
1800
1200
1500
2500
50
2500
(60 dip)



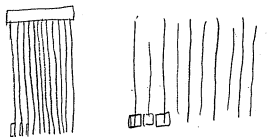


72000 - 12 rows -

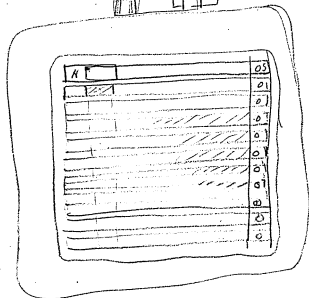
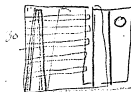
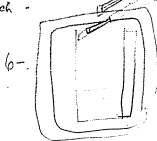
120

1 Row 1 mileamp - 12 12 mileamp - 1 mile



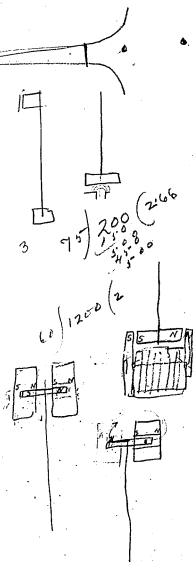


6 to each -

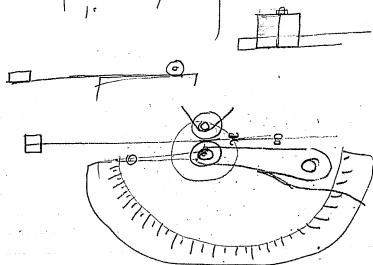


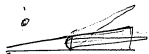
70

3 Sec in 10th 3 10 = 4-10-5-10 = 6-10-7
7-10-8-9 10-10-

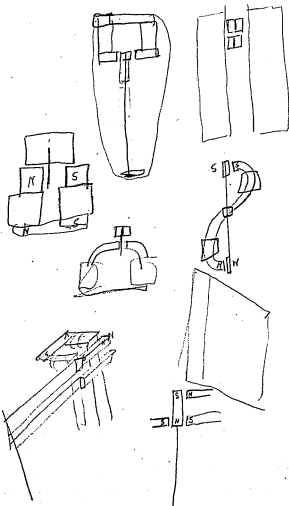
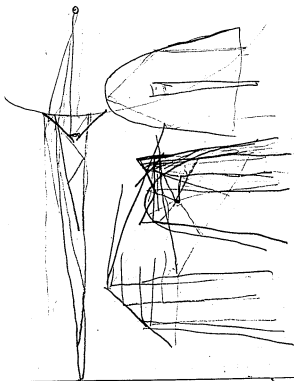

$$\begin{array}{r} 160 \\ 75 \\ \hline 800 \\ 11200 \\ \hline 12000 \end{array}$$

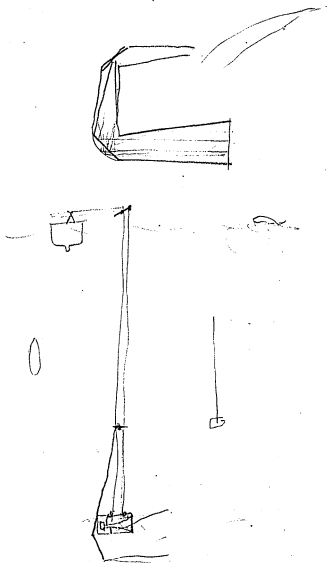
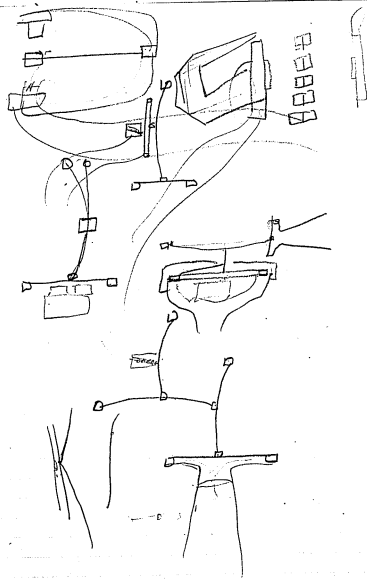
$11 \frac{1}{2} \div 2 = 5 \frac{1}{4}$
 $12 \div 2 = 6$
 Phone at 160 makes 1200
 inches min - or 20 inches around
 to get wave $\frac{1}{2}$ long to size in Micro
 1 Vibration second gives 1 wave 20 inches
 long, 20 waves 1 inch - $\frac{1}{2}$ speed $\frac{1}{2}$
 appeared $\frac{1}{2}$ - phone showed run
 20 Rev min. if fan goes 400 Rev
 where 3 blades - as 40 v slowest
 must run fan 800 Rev min
 to get waves $\frac{1}{4}$ long

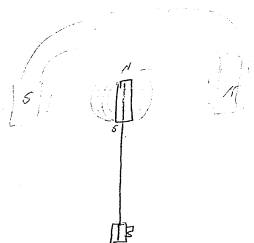




28-50







Notebook Series -- Notebooks by Edison
Notebook, N-17-04-24

This notebook was used by Edison in April 1917 to record work for the U.S. Navy during World War I. Included are notes pertaining to a series of experiments with various resonators constructed with tuning forks, phonograph diaphragms, and columns of water of varying heights. One entry gives a description and drawing of a related sound measurement device. Several entries indicate that Edison was assisted in these experiments by Jerry T. Chesler, who was able to hear sounds that Edison could not. A second set of entries relates to experiments on direction finding for sounds and objects, which were conducted at Sandy Hook, New Jersey, using telephone receivers and funnels. The pages are unnumbered. Only 22 pages have been used.

April 24 1917

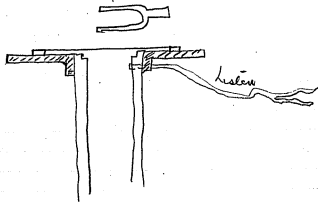
Experiments with air resonant Column
in tubes lengthened & shortened
with water. Closed at top -
end by Phonograph Diaphragm
& 293 vib sec forked used

So far Experiments show
that if top is open -
the length of Column is $\frac{1}{2}$
of the wave length of
fork 11 inches -

But when closed by a
Diaphragm about size of
tube its length is $\frac{1}{2}$ of
the wave length -

But if the top of a $2\frac{1}{2}$
dia tube is provided
with a large circular
platform

293 v6



And rings covered with a heavy diaphragm are used the results so far are variable. The diameter of diaphragm & the chamber does to use of larger diaphragm than dia of Tubes brings in new factors

First test shows
30 inch column No coals
Edison only heavy fork 15 in
Shortening Tubes 2"
Shortening Column by use
of coils made it weaker
The diaphragm used was $4\frac{1}{2}$
inches

When a $3\frac{7}{8}$ dia diaphragm
was used, still 30", no water
Edison got it 4 inches away
after tuning fork from diaphragm

With a $3\frac{7}{8}$ dia. water had to
be used until the air
column was only
EIGHT inches. Then Edison
got it at $4\frac{1}{2}$ inches

With $2\frac{1}{4}$ diaphragm - air column
was $19\frac{3}{4}$ for best point
Edison got it at $3\frac{1}{4}$ inches

The above experiments
are very conflicting -

Possibly the diaphragm
has a tone itself when
 $3\frac{7}{8}$ dia & threw it out

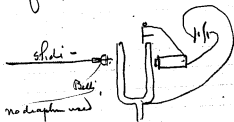
WE now tonight have got a
new tube 50 $\frac{1}{2}$ inches -
with large water gauge
outside but connected to
Column with index -
Dia inside of tube $2\frac{1}{4}$ "

WE also have the same
diaphragm - but in addition
have discs of brass -
to fit in a notch at top of
tube to reduce the hole
from $2\frac{1}{4}$ down to $\frac{1}{2}$
inch -

Also we have extra disks
in which the same thing
is attained of controlling
size of hole + at same

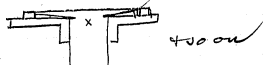
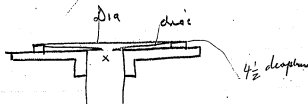
for time we use a self
balancing fork about 290.
using Midget —

In front of the prong we
have a Bell receiver which
can be adjusted to & from
the prong.
Probably most of current
is due to the magnet exciting
the fork.



very hard to about
1/2 away from prong
using Bell to listen to.

time making a tapering
Chamber



Hole X.

Experiment #1 4 1/2\"/>

Jerry finds best point 30.6"
for length air Column

Edison Cant hear it thru Ear
tubes, when phone $\frac{1}{4}$ from
Diaphani - So there is no gain
but a loss of Volume is this
arrangement as it is -

Ear tubes $\frac{3}{8}$ for 10" + $\frac{3}{16}$ for 12"

But Edison Cant hear phone direct
Except pressed hand against ear
when just against ear a few hours with
afraid touching E Cant hear
anything -

Jerry thinks that with 6.5 air
Column he gets a little
louder than at 30.6 inches

Jerry says fork is lower tone than
293 on account of Magnet etc

He says he can tell the best
sound easier now & more
accurate as current or
sound is somewhat weaker

Expt #2 Same $4\frac{1}{2}$ " Dia
But with Taper. Chamber
having $1\frac{3}{4}$ hole over
Column.

Jerry finds best. 5.8 for short
& 25 for long - also at
32.5, then high note, may be the
spring on fork.

Jerry thinks Volume about same
as in Expt #1 - but has no
index to tell by - will
try one up after making
preliminary runs.

Not quite as loud
as # 12

Expt 3-

Same $4\frac{1}{2}$ dia + ring but
hole in ring is now

$1\frac{1}{4}$ inches - (We left out
the $1\frac{1}{2}$)

Short Column 5.2 inches
long. ~~Diff. 2~~ ~~not so loud as~~ ~~not so loud as~~
not so loud as # 2 Experiment.

Hear phone at a distance
from the diaphragm of
 $2\frac{1}{2}$ inches +

also when listening
to phone direct its

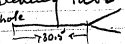
$2\frac{1}{2}$ inches. This
shows that we can
do as well with
Resonant Columns as
tubes as - without - giving

No gain in Volume
+ yet get benefit of
Presence to diminish
general noise —

Guess its to 62. a go
but dont understand
these short Columns
without the tone
of Dia or - over tone in fork
made by magnet becoming a segment
into vibration - probably this +

Next morning found a piece
of tape had fallen on fork first;

Repeated Experiment - Long
Column 30:3 short 5:6

Listening tube - straight part
 $\frac{5}{16}$ hole  short tube
9.1 $\frac{5}{16}$

We now try the Experiment over
with the shorter listening tubes.

Can now only hear music note
2" instead of $2\frac{1}{2}$ with
long listening tube.

Short listening 509

This is practically the same
as with long stereoscope tube.

We now try long Column
with short stereoscope tube -
it shows 30:1 practically the
same.

Reading this

29.7 inches -

29 " "

30 " "

30.1 race of fall.

30.2 about 1% -

30.3 or $\frac{1}{10}$ of 1% fall.

$1\frac{1}{2}$ away

$1\frac{3}{4}$

$2\frac{1}{8}$

$2\frac{3}{4}$

$2\frac{1}{2}$

$2\frac{1}{4}$

A rough test show sound of
fork goes from silence to silence -
22" to 34"

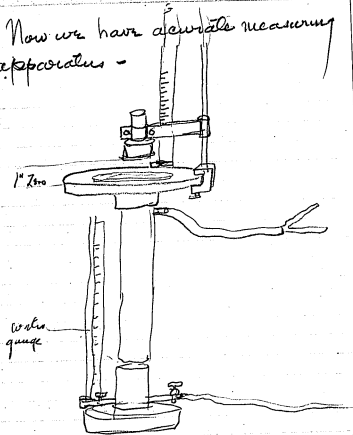
but this is too rough to
Judge by.

Ferry finds that outside noise
tends to hit diaphragm + start air
column going giving same note
as fork, but its weak -

Also moving of the water column
Scraping up rough sides of
the brass tubes makes noise
must be polished or made
of glass

H. L. W. 1922

Now we have accurate measuring apparatus -



Fork 293 about electrically
 driven - Bell lever
 no Die about $\frac{1}{8}$ " away

from prong

We find that to get accurate results must run Cuvors nights -

Practically with $4\frac{1}{2}$ dec
 $2\frac{1}{4}$ opening

Most part of Note is heard
in 1 inch range +
peak in $\frac{4}{10}$ th of inch its
three as loud in the $\frac{4}{10}$ as
other parts

In a rough preliminary
Experiment put a microphone
in chit at sending
station + made noise
Jenny at 4 inches could not
Could not hear note 1" away

hears note but heard
noise 7 ft -

I could hear note when
phone at ear. + noise $\frac{1}{4}$ " from
ear but no note -

Putting Recor on Resonator
4" up Jerry heard note
+ of course noise

Note was of course
amplified relative to
the noise -

It looks pretty good?

Jerry heard fork on $4\frac{1}{2}$ Dia $2\frac{1}{4}$ hole
2 $\frac{1}{8}$ inches on scale against 18 holes + 10 $\frac{1}{8}$ inches
This shows big loss of efficiency
to detect any noise -

Dandy Hook Experiments

Exports for direction -

Yacht anchored off NYC R.P. Pier
 Highlands - Small dinner bell 4"
 used Clapper fell by gravity on
 bell - Used Skiff - Receiver #3
 Weather perfect & ideal

Funnel straight in line with Bell
 + 90 deg + 180°

50 yards		
Straight	High	60
	Low	60
Angle 90°	High	42
	Low	20
Angle 180	High	34
	Low	18

100 yards		
Straight	High	44
	Low	32
90°	High	14
	Low	8

Deep - 90	High	36
	Low	16
180°	High	24
	Low	12

125 yards

Straight	{ High	30	
	{ Low	26	
90°	{ High	28	
	{ Low	22	
180	{ High	1	Noise
	{ Low	2	Very faint

40 yards

Straight	{ High	60	
	{ Low	56	
90°	{ High	46	
	{ Low	34	
180	{ High	44	
	{ Low	28	

Water in the afternoon when
weather changed & sea was
noisy again -

Isak more feedings
Squally white Cops
Dance apparatus

To sum up

The strength of signals if funnel
is in direct line is TWICE
as great as if funnel way 90 degree
from direct line to sound

% is Direct line funnel 53.6 %
90° " 25.3 %
180 " 21.1 %

The further away the sound the
better is capacity to find direction

50 yards	Straight 61.1 %	90° 20.4	180° 18.36 %
100 yards	53.6	26.6	20 %

50 yards brings in an error as box is 60

Straight 100 90 only 50
or 1/2 -

75 yards
Straight { High 28
 { Low can hear

50 yards
Straight { High 46
 { Low 32
90° { High 22
 { Low 16
180° { High 6
 { Low 0 can hear

When puff of wind comes
Bell was lost completely.

25 yards
Straight { High 60
 { Low 40
90° { High 30
 { Low 18
180° { High 30
 { Low 8 * sudden quiet

Hear also a boat which I

Can hear with funnel on
40 3/4 further than
without -

or 18 1/2 times more
sensitive -

Couldnt see upon investigation
Saw a tug boat about a mile away
directly in line with the funnel

Tests # 3 with funnel
disconnected - #4 same 4" less

75 yards Cant hear
50 " " "

40 yards just hear on high
this is limit - 5

Funnel On

40 yards	(High)	52
	(Low)	40
45 "	(High)	38
	(Low)	34
175 "	(High)	?
	(Low)	6

Noise greater now -

This proves funnel is of enormous
Value. both for distance & direction

Notebook Series -- Notebooks by Edison
Notebook, N-17-06-08

This notebook was used by Edison in June 1917 to record research performed for the U.S. Navy during World War I. This work was probably done in connection with his attempts at aiding submarine detection. Included are cursory specifications for a group of devices, numbered U1 through U21 (and referred to as "galvanometers" in later notebooks such as N-17-06-28), to be used in measuring amplified sound. Also included are notes on a series of experiments with possible amplifiers for detecting sounds. Several notes indicate that Edison was assisted in these experiments by Jerry T. Chesler and that a "Telephone Audion Expert" was also consulted. One entry involving a failed amplifier contains the notation that "This is Hell—War is Hell—The soul of some German must have got into the audion bulbs." The experiments are continued in N-17-06-14.1. Inserted into the book is one loose page of notes, annotated by an unidentified laboratory employee, repeating some of the instrument specifications. The front cover is labeled "U2." The pages are unnumbered. Approximately 65 pages have been used.

17-06

U1 - 10 needles stretch $\frac{1}{2}$ gram $\frac{14}{32}$
total length fibre, Rubber holder
Stop -

U2 - 10 needles stretch $\frac{1}{2}$ gram $\frac{9}{32}$
total length fibre - Stop - Rubber holder

U3 5 needles - stretch $\frac{1}{2}$ gram -
 $\frac{9}{32}$ total length fibre, Stop - Rubber holder.

U4 18 needles

U5 2 needles, $\frac{1}{2}$ " stretch $\frac{9}{32}$ total
length fibre, Stop - Rubber holder
Needles twice as long $\frac{1}{2}$ " about

U6 2 needles $\frac{3}{16}$ long - stretch $\frac{1}{2}$ "
 $\frac{9}{32}$ fibre, Rubber holder - Stop -

U7 10 $\frac{3}{16}$ mag 005 $\frac{7}{32}$ mirror
Rubber holder - turned out
 $\frac{1}{32}$ deep $\frac{9}{32}$ fibrz, stopped -

U8 - 2 magnets $\frac{3}{8}$ long $\frac{7}{32}$ mirror Metal
holder - this turned out $\frac{1}{32}$ deep, these needles
 $\frac{1}{4}$ less in length than U5.

U9 - 10 needles $\frac{1}{2}$ " stretch
 $\frac{9}{32}$ fibrz, Rubber, slap

U10 - 10 mag $\frac{3}{16}$ - $\frac{7}{32}$ mirror
turned out Rubber holder $\frac{1}{32}$ deep
hung on a reg silk thread of many
fibrz - not assembled right, fibrz worked
so off scale

good one
used
2 weeks

U₁₁ Reg rubber 5 needles - Mirror
□ $\frac{1}{16}$ wide $\frac{7}{32}$ long $\frac{9}{32}$ fibers

U₁₂ 5 needles - $\frac{9}{32}$ -
Has ring magnet in it
 $\frac{1}{16}$ thick $\frac{1}{4}$ long

U₁₈ - 5 needles $\frac{7}{32}$
Mirror 005 - 5 needles 005
thick - $\frac{3}{16}$ long

U₁₇ $\frac{7}{32}$ mirror 005 glass 5 magnets
005

U₁₆ $\frac{3}{16}$ Mirror 005 glass 4 magnets
005 thick

U₁₃ $\frac{4}{32}$ fibre length
10 needles

U₁₄ $\frac{6}{32}$ length of fibre
10 needles -

U₁₅ - $\frac{2}{32}$ fibre length
10 needles -

U₁₉ - $\frac{3}{16}$ mirror 5 needles oos
fibre stretched with 1 gram

U₂₀ - $\frac{3}{16}$ mirror ^{oos} 5 needles oos -
stretched with 2 grams

U21 3/16 micron 005-5 magnet
005- stretched with
1/2 grain - fibers length
5/32

Uq - Mica wing - steel bar over
divisor $15\frac{1}{4} = 98$ milamp
swing $1\frac{3}{4}$ — 6 Vibs
Phone $\frac{1}{2}$ away - Very dead
beat stops instantly when
Key open -

Phonoplex $\frac{3}{4}$ " swing -

This experiment shows that
for sensitive news we should
have the smallest Yanc or
air resistance

Very steady - nearly dead
U8 = swing $3\frac{1}{2}$ 6 Vibs
m. amp - 58⁺ Phonoplex 1"
Phonoplex $1\frac{1}{2}$ swing $\frac{1}{2}$ "

Note this should be more
sensitive than U5 yet is
less sensitive probably
due to Eddy Current
in the metal holder
U5 having Rubber

U7 = 6 Vibs - Phonoplex 1"
swing $9\frac{1}{2}$ " 59 mil amp
long time to come to Zero
when Key opened, somewhat
sensitive to shock -

Phonoplex $1\frac{1}{2}$ swing $2\frac{1}{4}$

U10 - 6 Vibs - Phonoplex $\frac{1}{2}$

$7\frac{1}{2}$ " Swing seems to vibrate
several times faster than 6 Vibs

176 kilamp - possibly
a multiple judging from the
amperes on dial

It really is - a multiple
When dialer circuit
opened we get $4\frac{1}{2}$
swing -

Now Phonoplex 1"
Swing $\frac{1}{4}$ =

Not promising

U11 - fairly stable -
 stays zero + vibrates
 by far scarcely any
 when Director 6 Vibs
 sec
 probably its so light
 that Magnet holds it

Very steady at 18
 Vibs
 Light is very poor
 Can scarcely see it.
 when 6" swing

6 Vibs second
 U11 - Swing 10" phos 1"
 phos 1 1/2" ^{m. amp 35} Swing 2 1/2"
 phos 2" 3/4" swing -
 phos 3" Nothing -

24 1/2 Reed 18 Vibs sec
 Phonoplex 1" 6 1/2 swing -
 300 m. ampere -

Phonoplex 1 1/2	2 3/4	Swing
Phonoplex 2"	2 3/4	"
" 3"	2 1/4	"
Phonoplex 5"	1 1/2	"
Phonoplex 7"	3/4	"

Think if mirror turned
other way gives a brighter
line

Now

other way

as area is $\frac{1}{3}$ in

Its quiet at 3 Vibs
needle steady & slow

U11 Continued

We set Read at $29\frac{1}{2}$ "
12 Vibs per second -

~~Phonoplex 1"~~ Phonoplex 1"

Swing 8"

M. amp 150 -

Phonoplex 2" $3/4$ - to 1"

Now 3 Vibs Record

Phonoplex 1"

Swing $3\frac{1}{2}$ " no current
no steel magnet - no

Tuning

Phonoplex 2"

Swing $1/4$ " to $1/2$ "
But not fully tuned but reads
unusually well

U12 - Phonoplex 1"

Swing $2\frac{1}{2}"$ 41 unlamp

Phonoplex $1\frac{1}{2}"$ $\frac{3}{4}"$ swing

" 2" nothing

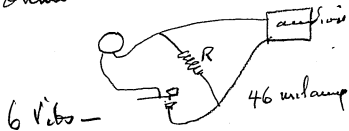
18 Vibs - $24\frac{1}{2}$ Reed

Phonoplex 1"

Can't get anything

NG

June 8 1917
 Experiments with Reg
 Mirror outfit to 3U
 Rubber Bobbin - 5 A, 350
 ohms -



R has 7 ohms, phonoplex
 30" away - swing 4"

Now R is 36" away - 5" swing
 Tried 42" ~~but~~ something
 changed had to make R's sheet
 several hundred ohms

again 36" phonoplex away
Res 700 ohms Swung
4"

24" away long Bell no
deafened - Swung
4" (Res 5000 ohms)

Opening Mirror End circuit
1 min dont build up

Something wrong
Somewhere -

5

1

It was out of tune -
gives at 24" away if
phenoplex when
tuned good 8" swing
steady 50 kilamp -
100 ohm shunt - 5" throw

Note - Phenomenon
When Res of shunt is
increased the swing
come way down
to 2 or 3 inches - some
inductance Phenomenon
going on here -

Removing sheet
altogether swing
goes to 14 inches -

Using Quad Res-Box
3300 ohm sheet 2"
swing -

100 ohm 7 inches -

Opening sheet altogether
14 inches -

With Paul Resistance Box

100 ohm in sheet 4" swing
1000 4 1/2

2000	nothing
3000	$1\frac{1}{2}$
4000	4
5000	5
6000	$5\frac{3}{4}$
7000	$6\frac{1}{2}$
8000	$7\frac{3}{4}$
9000	8
10000	$9\frac{1}{2}$

Far as Can go —
 When Paul Res is Offended
 goes to 14" swing
 Paul acts

We now put phonoplex

30" away 4000 ohm in
~~Pushbutton~~ ^{Swamp} Swing $3\frac{1}{4}"$

Now 36" away Swing $2\frac{1}{2}"$

Now 48" — nothing
Even with shunt off -

Now 42" away nothing

Now 36" " now 8"
with 4000 ohm shunt.
after a little while goes to
 $14\frac{1}{2} @ 15"$ & close key &
let it vibrate. after

6 Vibs - 47 mil amp
Soldering phonoplex
wires - ~~bottom~~ swing
4"

WE now make ampers on
audion lamp battery
right, & solder the
600000, shunt an audion
with Wheatstone 4000
ohms

Trouble again can't
get at phonoplex 24"
away -

Now find shaking

one of the Silver Cell
Cells connected N to grid
it jumps needle
violently - possibly
electrodes cross
or silver tree formed in
cell -

W₂ substitute 2
Dry small $2\frac{1}{2} \times 3$ "
delands, specially made
for Audion work -
no changes made
work

I note that with 100,000
chinese resistance substituted
for the 600,000 10% got
same trouble a
phone in Merros Ckt
I hear snaps loud
several will sound
without moving
Merros than a rather
which happens to
strike the swing night
will nearly throw
it off scale.

If I stop used it does
same thing - while
stopped if I vibrate
key at Mirror it
gives continuous Knocks
in phone after a while
+ Mirror keeps off
scale -

One Bug found

Reed alone with Res in
place of phonoplex
Can hear it continuously
in phone at Mirror
when phonoplex on it

Strong when phonograph
off + ~~the~~ Resilience on
Can hear every vib of
need but not so

Strong -

Mirror just winks
a little, as one
probably neutralizes
the other -

WE have probably found
the Bug - It is this

The Reed Magnet creates a powerful field, when the phonograph is close to reed it generates the waves + we can tune for them but when Phonograph is placed a greater distance away - The more wider field of the Reed Magnet predominates, as this on account of the setting of break spring lags + there will be a point where phonograph wave is neutralized by Reed field waves

When phonoplex is
surpassed then the
tuning must go from
47 mil amp to 63
mil amperes -

We now are trying
scheme to obviate this
defect. I ~~WE~~ hear
plainly the make &
break of steel magnet
by phone at ~~we~~ hear
from rebound of contact
spring it sounds like
a click -

June 9 1917

Every experiment we have tried so far on the Murrow resonance has been entirely misleading as to sensibility of the Murrow compared with the telephone,

The trouble is due to the powerful inductive magnetic field produced by the Reed magnet,

It interfered 1st because the Contact point was not in rotation with the tune on the Bell phone wires

2nd When the Bell was close to Reed. it was strong the big field of the Reed magnet surrounding it. When the bell was set away the Reed mag neutralized + we got nothing if bell is drawn further away the Reed magnet predominates -

Even of wire experiments where
connected $5\frac{1}{2}$ inch at the branch
End + diaphragm of bell 5 ft
away is attracted by the field of
Big Reed magnet extending
that distance.

We now put $42\frac{1}{2}$ Reed in
Milners room - & extend a
fine wire into Mavis room
Connect Reed with one
end 6" from clamp & the
other end to a long Bell
phone - whose current goes
to condition station -

The amplitudes of reed at		length
$5\frac{1}{2}$ from base	006	36
5	005	25
$4\frac{1}{2}$	004	16
4	003	9
$3\frac{1}{2}$	002	4
3	0015	2.25
$2\frac{1}{2}$	001	.1

Reed now making $\frac{1}{2}$ amplitudes
 wire 22#6" long set at $5\frac{1}{2}$ " from
 clamp - wire fastened to Bell diaphragm
 With break wheel in circuit
 and another phone in same
 circuit hear the Reed
faintly -

Steel May kept on clockwise
about 15" above Mirror

Coil of Mirror set N+S.

We now see if we can tune for
it on Mirror with or without
break wheel in operation -

wire $5\frac{1}{2}$ " on read
Wheel running Jerry hears
faintly - We get 1" throw
on U₃ with 65.8 Melamps
Heath Wheel Cut out phone in
at Mirror $6\frac{1}{2}$ phone Cut out
 $7\frac{1}{4}$ inch - Jerry hears
nothing when wheel
stops -

For fear the Reed Magnet
may precept lines 21 ft
we lengthen wire to 38 ft
+ try it again - say of wire about
same as with 21 ft

Get throw of $4\frac{1}{2}$ " ^{6" by functioning} with wheel
clapped + $3\frac{3}{4}$ " wheel ~~the~~
Running - Jerry says
very faint when wheel
running - now 65.3

Put on Audion - Mirror
Shunted 1 ohm 14" throw -

We now ~~show~~ remove the
shunt + put it at string
phone across it =

Shunted to sh 4" throw
Jerry not sure of Resistor
will try the porcelain spiral
wire

Spirals nq - Put in Queen
Bridge 10 amp - got 2"
throw & hear big strong
waves myself in phase.

65.3 to 67.1 Turned it out

All these Experiments
nq - We found that
Audion will not
amplify low rate vibrations
like 6 per second,
But found that of a
break wheel 3 to 400
second was put in

current it would start
to amplify - but there
is a current from the
wheel (thermo) which is
very loud in phone at
Winton. yet Mirror pays
no attention to it but
when Phonograph
& 4 iron pieces natural
past Bell without
deafening it responded
swinging 14" at
1" away -

When wheel was shunted
with 500 ohms screw
came down to 4"

When shunt removed
water put on wheel
it reduced Brown of
Bill way down

The Operation is what
causes the wheel to
permit Audion to
amplify 6 Vibs per sec
an intermittent Current of
a few hundred a seconds
or no thermos but the mercur.

Current interrupted (12) ~~the~~

Each wave of the 6 per
second broken up into
hundreds of waves -

Putting in Phone + 4 wire with
a straight Current through
1000000 - no mirror current

Phone at Mirror loud from
wheel. ———

Plain wheel now + phonograph
in wheel ~~amplified~~

Therow only 4" -

Wheel sound very much
reduced - (12) less thermos
current -

looks as if it needed 1000 or more watts per second to carry the slow 6 Vibs/sec loads from phone, & perhaps it would strengthen the 100 or more per second when we listen in on the water tube, 2500 per second already wouldn't bother our phone as resonance would cut it out anyway

We stop break wheel & put in a Reg phone in circuit with phonograph, & start a phonograph with music on it. This didn't

give any throw to speak of
on the mirrors from
6 Vibs of the Phonograph

It seems to want several
hundred ~~hundred~~ tracks
in the 6 Vibs themselves
+ in addition the same
number of tracks in a
current stronger than
the phonograph

Since the current
from track will is
practically gone on
account of coating

Wheel with Mercury

We are pulling in
Current with the

Wheel a German blow
iron Thermos Couple

heated over chimney
of a small Kerosene
lamp - The Wheel

will supply the breaks
the Thermos Couple supply
the Current & the Phosphor
in front of the ~~Fluorescent~~ ^{Fluorescent}

Wheel carrying the 4
iron segments rotated

Note, if this sort work
with various strengths
of Chemical Currents

Then the best results
were got from wheel
by the enormous necessity
of waves due to bad
Contact,

Probably it is really waves
to agitate the grid or
perhaps the iron of
the transformer

by a Disc motor will
supply the 6 vibrations
note - The Thermo Current
helps the Mirror 5 or 6" (Wires
Thermo above lamp too
Variable, will put some
end in water -

Note - Without Audion or
Break wheel the phonograph
~~is~~ set at 1" get $3\frac{1}{2}$ -
With Audion & without
wheel have to put phonograph

to within $\frac{1}{4}$ " of each
to get $3\frac{1}{2}$ rows -
showing actual loss.
instead of amplifying

over

We start fresh—

Phonograph one from the revolving
Rubber wheels Mirror not
shunted, No wheel or
Thermis— Phone at Mirror
in Contact Can't hear anything
Except slight whistling in
Auction —

All running every few seconds
Whistling in Auction
Suddenly increases—
When it does so spat
jump 10 or more inches

These apasms are 15 seconds
apart.

Tuned up to 175 Mc amp
Nothing — Then tuned
down to $16\frac{1}{2}$ Mc.

Not a sign of tuning.

Even at $\frac{1}{4}$ " ^{phonograph away} 37 Mc amp
hear phonograph with phon
only when mirror jumps
off scale —

We now move phonograph
away from Ribbet wheel
7" Spot dont move
+ there is no wobbling
or jumping of Audion

but we get nothing -

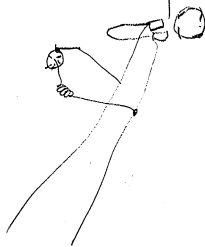
We start wheel, which has
been cleaned of mercury
phonoplex 1" away
+ wheel running get

5" Throat - stop
wheel get nothing
hear wheel when
running loud in
Merros phone, showing
phonoplex is giving
loud sound but no
amplification over
straight circuit.

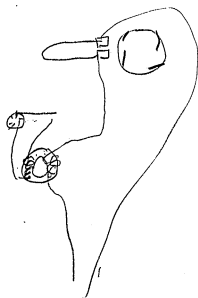
Note -

Guess wheel dont
give them, its the
current from the phonoplex
that broken up into
sound & yet the high note
amplifies but the
6 V. waves dont
amplify to give the
brow right.

300 ohm in phonoplex
current including my
wheel swing $1\frac{1}{4}$ "



W. Multiple arc
the wheel with —
ohm in the circuit
just hear wheel
mirror throw $\frac{1}{2}$ " & less

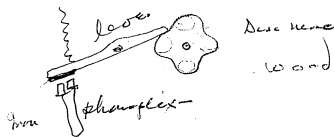


We hear family the wheel
showing must be some
Thermo/Current.

12 Midnight - Cannot get
amplification by Capacity
across mirror, either a phone
or 5 Mf Condenser or both -
or phone in series or Condenser

Have concluded that
our Rubber Wheel
with iron across does
not give a wave that
can be tuned. We now
cut out a Cam wheel
to be put on phonograph
giving movement to a
lever on the end of
which is a piece of

Iron in front of the
phonoplex - This should
give a true wave



5 All-finished Cam
wheel =
Phonoplex set 1" away from
lever iron when it is nearest
to the phonoplex 5/8 throw

The Audion out Tuned
gives at times 8" but varies
on account of friction on
wheel, Varying the speed
of Phonograph, Melamps
on Detector. 38.2 —
Doing 1" - 37 melamps on
detector,

Hear it in phone at Mirror
with Audion in —

Very Strong at 12 inches

away of phonograph —

+ ~~and~~ light continuously

thrown into spectrum,

but speed of Desc varies
so much I can't tune it

in addition Audion Kicks
with static,

Monday - Telephone Audion
Expert came at 6 pm -

found no way of amplifying
was as good as direct wire

Finally we made up one
Audion. He use 40 mf

Condenser ~~about~~ 4 multiple
used 3 Audion lamps

with this we got at
1" away of phonograph
from Rubber Cam
wheel 14" across

which is amplification
of $3\frac{1}{2}$ times - at $1\frac{1}{2}$
away a phonograph
got 2 inch throw -
also cut out Phonograph
put a Bell ^{phone} right in funnel
of cylinder phone &
listened by another
phone, it was very
weak but I could hear it
Bell put at another then
it amplified I should
say $3\frac{1}{2}$ times also
But I noticed it forced

Merris somewhat, on
low notes of Beethovens
funeral march, especially
where there is a pause

§ 10 $\frac{1}{2}$ now connect up
another section
with only 1 lamp
as spent lamps etc all that
necessary on 2nd stage
as major work comes
on first stage -

The wooden wheel is
out 3/16  $\frac{3}{16}$ shorter than others

Direct 1" away 4 inches

14" 1" away

$3\frac{1}{2}$ times — 2" $1\frac{1}{2}$

Second condition —

10" $1\frac{1}{2}$ away —

$3\frac{1}{2}$ 2" away

$17\frac{1}{2}$ times amplification

$$\begin{array}{r} 34 \\ 14 \overline{) 475} \\ \underline{28} \\ 65 \\ \underline{56} \\ 95 \\ \underline{84} \\ 115 \end{array}$$

When the 2nd stage is in
it went to 10 inches when
phonograph set at $1\frac{1}{2}$
and $3\frac{1}{2}$ inches set
at 2" away —

put a mica diaphragm on
Sever of Rubber Wheel
got about same waves
of harmonics as with
sheet soon as ~~when~~ phone was $1\frac{1}{2}$ away
While this was on
Expert made a change
in Audion & got
several inches waves

When ~~for~~ a bell
phone held 2 ft away

This change made by
Expert enormously
increased the
amplification as
far as air wave is
concerned - We now
put back the iron
on lever & try it as we
originally had it.

This only gives 4"
throw at 2" away
showing improvement of

$\frac{1}{2}$ " by the change
the improvement of the
other way was due to
Knock of the Plecter on
wheel -

after an hour ~~and~~
~~of the same~~
tried again but
Academy Kicks
Can't do anything at
2" away - This is Hell -
Was - Hell - The soul
of some German must
have got into the Academy
Bulbs -

I am w² quit as power
started & faro had
Will start this pen
with a lot of new
apparatus Connected
with the Audion

Wednesday Night ¹³

Brass 4 wave wheel - Direct 4"
When phonoplex 1" away

Two Audions	1" away	16" swing
"	1 1/2 "	4 1/2 "
"	2" "	1

An attempt to put 3rd audion
on. Waves, badly when through

Scriven says

1	audion multiplies effect to 2	
2	"	8
3	"	32
4	"	128

Assuming we get 4" throw on
Mirror direct without audion
with 4 audions we should
get 128" comparatively speaking

stopped, now trying find
out trouble,

5 am - get $3/4$ " throw
with 3 audions -
using 120 Volt Lalande 17/44
Sunell dry cells only
Best so far done, its
steady -
Phonoplex 3" away
Director 37.1 Milamp

this With - Vis

With 17 10 mag Director
is 65 Milamp. nearly
double - Phonoplex 3" get $1\frac{1}{2}$ "
throw

Make 400 more cells -
Lelande.

As the Audion is now quite steady
the steadiness of the Lelande
helps - Wants more of them
Think V15 is preferable -

I note that V_y is very much
more sensitive to shocks
than V15 - as V_y has twice
number of needles perhaps
its due to greater weight

Now we put in V16 -
Detector at 28 Mc amp
gives 1" throw, throws some
phonograph - 3" away
Hard Rubber Bobbin been
used lately 350 turns

Phonoplex 3" away
We put in the High
Resistances — 2066 in
of Ueerris — Don't improve
think the 350 Coil best

[ITEMS(S) FOUND IN BOOK]

U 19 $\frac{3}{16}$ mirror 5 needles - fibres
stretched with 1 gram
Mirror .005 needles .005

U 20 Duplicate of this
but stretched with
2 grams
Mirror .005 needles .005

U 21 Duplicate above
with $\frac{1}{2}$ gram same as
now. but instead of
 $\frac{9}{32}$ total length of fibres
use $\frac{5}{32}$ -
Mirror .005 needles .005

U. 2. U. 9. U. 13 have been changed

Notebook Series -- Notebooks by Edison
Notebook, N-17-06-14.1

This notebook is a continuation of N-17-06-08. It was used by Edison in June 1917 to record research performed for the U.S. Navy during World War I. This work was probably done in connection with Edison's attempts at aiding submarine detection. Some of the entries bear notations by Jerry T. Chesler. Included are diagrams and descriptions of experimental amplifiers for detecting sounds, along with notes regarding their performance. The components involved include audions, induction coils, batteries, condensers, telephone receivers, and mirror galvanometers. One set of entries describes experiments to ascertain the cause of "flickering" in audion circuits. The experiments are continued in N-17-06-28. The front cover is labeled "U3." The book contains 100 numbered pages; page 100 is blank.

17-06-11/2

14th June 1917
8pm start, 1

Vis in - 3 and ions - 180 coll
Helium - 37.1 ml amp on
directly, Phosphorus 2"
away - nothing -

3 and ions
Changed to better Condenser
& lamps -

got at 3" 5" throw
at $3\frac{1}{2}$ = 2" throw

Ther is Gas yet,

Soon after Andron got
kicking & its kept
up till nearly morning

We now have assembled on ²
glass with vacuum & ~~leaky~~
Coils 1 audion -

3 Audion tubes -

160-Helander cells -

While Jerry got $1\frac{1}{2}$
swing with ~~phonograph~~
1" away the Audion
gives 6" - also 2" at
 $1\frac{1}{2}$ away of ~~phonograph~~
& $\frac{1}{2}$ " when 2" inches
away -

Lottery Coil as input
Coil ~~for~~ vacuum as
output Coil -

June 15 - 8 PM

3

1 Audion - ^{output} Using Condenser ^{56mf}
for output, and 4 Western
Elec Coils, 900-600,000-Coils.

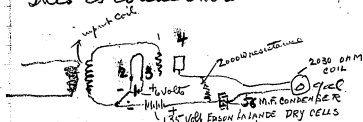
Secondary in series, primary
in series - used as input coil

2000 Res shunted across
Condenser - from which
big battery fans -

at $2\frac{1}{2}$ " away of phonograph
got $\frac{1}{2}$ " - at 3" away
 $\frac{1}{8}$ " of inch —
at 1 inch goes off
scale

This is connections

4



Using 3 lamps in multiple are

4 Western Electric

TYPE "L" WESTERN ELECTRIC AUDION
BULBS USED.

Putting primaries of the four
Western Electric input coils in
multiple and leaving
secondaries in series practically
no change. Perhaps it is a
little better with all coils
in series. When all coils
were put in multiple

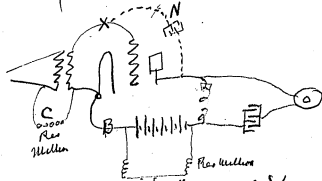
got about same deflection
as one coil in circuit.

Put in 92 microfarad
condensers in output circuit
the deflection began to fluctuate
and act untidy. ~~Put~~ Cut
out the extra capacity, we
now have only the 56 m.F.
condensers in output circuit.
Cutting out 14 microfarads the
deflection was cut down. Put back
56 microfarads

We now cut 6000 ohms
across output line instead

5
of the 2000 ohms. and
we get about $5/8$ " deflection.
a little better than before.

An Experiment



36 Microfarads put in at X

Phonoflex $2\frac{1}{2}$ " away
deflection $\frac{1}{2}$ about same, does
no harm -
We now try condenser at B
get nothing

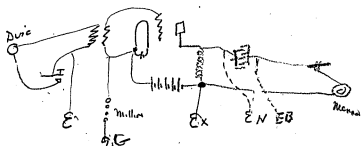
6
We now put it across N
~~we~~ get a little of phonoplate
but discharge takes place
with fingers on Key
just same -

In place of a Condenser
across N we put a
Million Ohms, ~~except~~
Inden Ink strip -

Think I get phonoplate not
certain - Zero shifts
sensitive to fingers on
Key - think Condenser
leak will deplete &
try each $\frac{1}{2}$ - No change
Million ohms at N was in

7
We now remove Res at N-
and put a resistance across
big battery & Earth the
middle of it to permanently
discharge the system to
Earth,
Ricks more than even with
finger on Key

We remove the resistances
& put them at C Connecting
primary & secondary across
Mellon Ohms at C



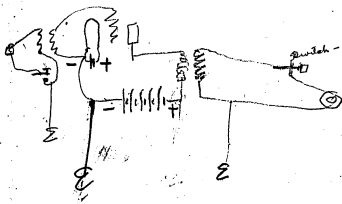
find try E_x \neq $E_N + E_x$ if no substrate
 E_N for E_x —

We get no deflection on Key
 by finger — but

E_N shifts zero to left several
 while if deflected + E_B used
 shifts zero to right several
 inches This shows
 leaky Condensers

9

We now disconnect Condenser
+ substitute Nermin's big
Coil NO 2



No kick anywhere Each
system grounded
6 vis sec $1\frac{1}{4}$ " with phonoplex
2" away. perfectly steady

Notwithstanding Touch Keys
Switch or any part of

Audion -

with this arrangement

Phonoflex 2"

One audion bulb in - $\frac{1}{2}$ " Thru

Two

$\frac{3}{4}$ "

"

Three

$1\frac{1}{4}$ "

"

Four

$1\frac{3}{4}$ "

no change

Five

$1\frac{1}{2}$ "

"

3 with present transformers
is as most practical

(5 WE input coils both prim + 5 in
series) no Condensers or

Silver Cells, or Leak coils

except Earth wire

as per diagram NO 2

11
Got another audion wkg
Storage battery - the 1st on
has leakage. which is
steady while 2 Bat gets needle
with key open about $\frac{1}{8}$ inch
for some reason (key is
connected to input)

Both audions operable
give about $\frac{1}{2}$ when
phonograph is 2" away

Now we will lead

12
if 2 Audions Each a
separate entity will
work together & amplify
properly without
the Janky Extra
Currents —

We make the filament battery
audion the first audion
at Input

get $5\frac{11}{2}$ " Throw at
2" phonoplex

$2\frac{1}{2}$ — Kicks out its $1\frac{1}{2}$ size
to the gas of backing the Kick.

Amplifying Ratio

13

1 to 2

1 to 4

1 to 6

1 direct -
1 Audion 2
2 4
3 8
4 16
5 32
6 - 64

1 Audion 4
2 16
3 64
4 256
5 1024
6 4096

1 Audion 6
2 36
3 216
4 1296
5 7776
6 46656

8 to 1

10 to 1

1 Audion 8
2 64
3 512
4 4096
5 32768
6 262144

1 Audion 10
2 100
3 1000
4 10000
5 100000
6 1 million

Thursday 21 1917

14

We now have 2 audions -

Each with 96 beads in
tumblers, 125 amp hours capacity
if liquid is changed several
times. These cells are in
glass tumblers & pretty well

Insulated -

2nd audion - 5 WE coils -
all primaries in series, 2nd & 3rd
secondaries - This is Input
Output Coil is Permo

1st ~~2nd~~ audion - Input coil
our new big one + lockwatts
for output,
at 2" away of

Thomoplex get $1\frac{3}{4}$ "
 Throwing steady - no static
 at $1\frac{1}{2}$ " was $5\frac{1}{2}$ " throw

When we tried the Kellogg
 little dry ^{with} added 38 Valts
 in bath Anderson it
 flickered, Took them out
 & added 50 V Storage
 battery to each Anderson
 it still flickered, Took
 them out leaving only
 Tumbler battery no
 flicker - There is
 creeping on the 2 storage
 also old dry & also

Note

Laburley Transform
has part of 1 Coil
short c'dd should be
345 ohms is only
245-

We are using 3 and iron
lamps to each set

16

Variable Currents from
gassing -

If only highly insulated
discharges will answer -

We now on NO1 addition
shift the low voltage output
Coil over to an Input
Coil & we need big Coil
to output, coil -

Don't get anything
at 2" something wrong
are changing back

Friday p.m.

17

Connected Kineam Transformer with all primary winding in series and all secondary winding in series using same as input transformer on first Audion. For output coil used Liebowitz transformer with 8 coils in series for primary and 4 coils in series for secondary. Get a 5" deflection when phosphor is 2" away -

Second Audion Set has 5 W.E. Input Coils primaries in series -

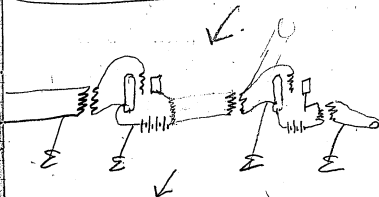
and secondary in series.
for output transformer
using train with switch.
Each Audion St has 3
type L N.E. Bulbs.

Each Audion set has
96 Leclanché Cells. in series
for grid current.

Changing input coil
to give 60 to 1 instead
of 40 to 1 no improvement
Changing output coil
to give $2\frac{1}{2}$ to 1 no
improvement, smaller
deflection. Changing
output coil to give

18

$1\frac{1}{2}$ to 1 - deflection becomes
unsteady and jumps.
We have just found another
N.E. input coil and will
add same in series
with 5 now connected
on second audion set



We try this to get rid
of $\frac{1}{2}$ the transformers

At times Audions Especially 1 audion
is absolutely quiet. Mirror spot steady
at zero. Sometimes 2 audions are
perfectly quiet; then they will
start to flicker moderately & other
times violently, without
any change in the apparatus
Possible, Wireless, or induction
or Earth tremors & atmospheric
charges or electrification, or
lightning - or Variations of
battery contacts, or creeping
insulation is cause,
hyposcopic atmos etc.

Sunday 23rd 1917

19

Experiments to ascertain cause
of flicker or inconstancy of
Audion Currents —

No change from Saturday —

1 Audion, Very slight tremor, Electro
Current Cut off in building — Storage
But on Mirror Lamp ~~current off~~
mirror ^{absolutely} ~~steadily~~ showing no jars —

2 Audions — with Current
Cut out of building, light
flickers 1" to 6" continuously
put in a phone in Mirror
Ckt Jerry hears it plain
its in snaps & also a
a weak continuous

With my Key 9 open & lamp
 not going to cond. on -
 but on opening the wire was
 still connected & acted as an
 antenna = apparently on
 opening both the flickering
 was less ^{more or less irregularly,} on closing
 the input coil & cutting
 off the phonograph circuit
 the throw was bad 2" to 6@8
 no improvement,

Jerry on phone insert in Mirror
 Circuit thinks he hears wireless
 calls etc. = opened switch of
 Mirror put moist hand.

across, Jerry hears steady
noise but Shaps + big clats
disappear + Mirror stands
at perfect quiet -

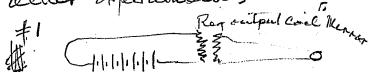
Grounds all taken off -
Mirror throws just the
Dams - 6 @ 8"

Jerry thinks he hears the
movement of a Corless
Engine -

We now ask Power house phone
to pull switch + disconnect
our buildings around us -
He cant do it, although opened
every switch - fine system
(lost how)
Disconnect will disconnect
at roof of our building

Where there is a fuse plug
he cant do it.

So we will go on our
other Experiments



Listen & also note mirror - 2 amp
from battery. This is too strong
will get Resistance in -

25 Milamp - Made steady

Hear nothing in phone

No click on opening or
Closing Mirror ckt.

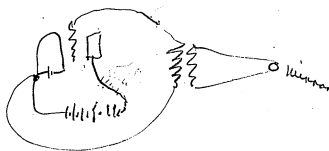
Experiment # 2

3 bulbs in Multiple

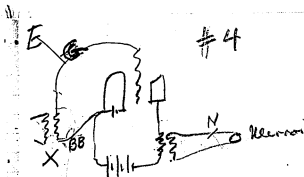


10 lamp filament photo lamp fil

Constant no movement of mirror
no sound in phone -



Mirror absolutely zero - no sound
in phone,



Input coil in but Open primary on
 it's steady - no sound -

But when X wron core is
 even gently Tapped with
 wooden pin ^{mine} goes off
 dead -

disconnected grid from X
 Steady. Knocking don't
 do anything

WE connect ground wire
 to G for #4 - steady but

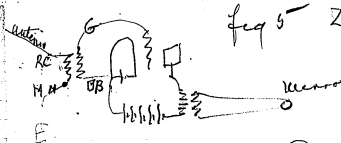
The Secondary Coil connected
to grid must be highly insulated
apparently so grid cannot
discharge electron charges to
Earth,

25
When I touch switch in
Mirror Switch N with
hand Arrow in several
inches which comes to
Zero if hand held on

We now shift ground from
G over to BB. fig 4.

Don't give any more now
with hand —

This shows we don't want any
grounds at G in any
even as it discharges
the grid.



We disconnected ground from
G + BB & put the binding
covering to primary at RC using
it as an antenna -

Do not get any second needle
nearly quiet $\frac{1}{2}$ jar at times very bit only
jar

We now ground the other end of
primary input which was open
in above experiment - the needle
at time vibrates $\frac{1}{8}$ - but its fairly
steady at zero.

1st anderson

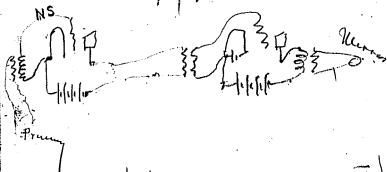
freq 6 - 27
2nd and



All grounds off - We note
Connect to secondary of
1st anderson output coil.
Secondary - primary being
open - when X closed only left
wires -
(This is only coil on 1st anderson)
Needle steady faint tremor
1st anderson coil is very
insensitive to knocks with
wooden pin whereas
the 2nd anderson input
coil is very sensitive

2nd caution coil made wrong
 too many Contacts
 whereas 1st caution
 Coil has only 4 Contacts
 at plates, hence less
 sensitive

fig 7



Lights at roof disconnected
 Primary open leading to phonograph
 branches $\frac{1}{2}$ " at times —
 after lights at roof connected

29
get 1" at times + 8" known
when switch first closed

Now put primary in
circuit on phonograph
~~to test~~ with 1 cell in

Phonograph ckt, circuit open
at key get the weak continuous
hum Edison can just hear
this don't hear needle sound
any - When key closed get
the click + then it sings +
needle violently agitated
off scale as long as it
hum, by opening key

heard him stops + weak him
appears, sometimes the heard
him flickers, is skippy

I notice when Key is open +
only weak him is heard
a momentary touch of key
stops weak him for say
1 sec when it appears
if I held Key closed
longer it takes 3 or 4
seconds to appear.

We now take out battery
from Phansplex Ckt
& put it in at NS fig 7

31

The note of loud hiss is even
louder & apparently lower
note,

Phonograph off - phony
input closed - no hum but
get rumble that shows means
3 @ 4" — battery at 115 is -

Now battery at 115 out,
just same - hum & rumble

WE now disconnect
all wiring with 4 wires
with Colons & use

I should mention
that when switch
connecting building
wiring to phonoworks
line needle jumps
several inches -

Putting on phonograph
current brings the hum
strong & big throw of
needle

We must be sure that no induction
current at output end of the 2 anderson
ever goes back to the input anderson as
it will ruin it

32

Twisted 2 wires rubber coated
This to simplify matters
for serving with tin foil -

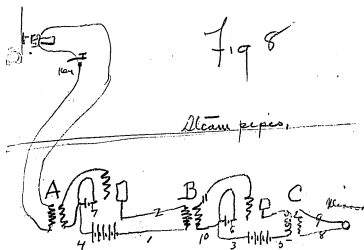
We leave out the branch of
phonograph current which runs
to Mirror for fear it takes
back a wave to 1st anderson
from the 2nd

The Mirror itself generates a
wave & might throw it into
this branch current & start
it when the anderson again -

602

There is a possibility of C throwing
Magnetic or Electric lines
into B & B into A thus
ruining perfect Vacuum action,
Lead wiring & Enclosures of
A B & C in closed iron boxes

The steam pipes may get
Magnetized by transformers
& gives an oscillating waves
Especially C is it has many
outside lines & B also is
not good.



Plain twisted rubber wire all them
no return wires to input of A & C
no ground wires

Monoplex wires entirely disconnected
primary of A closed -
Swing from zero to 4 @ 5" at
times Jerry says "Hums but I can't
hear it so its lower in volume"

2nd change fig 8. 34
We now put lead covered wire
from Merror to 2nd audio output
& from 2nd audio input to
1st audio recept.

A primary short occurred
before grounding lead Merror
seeing lead & got lead him
when grounded lead of
one section, him & throw
want lead, on grounding
the other section of lead
I couldn't hear him
Jerry says very faint
get very weak snaps
Merror. $1\frac{1}{2}$ to 4" then
no quick jerks but mostly 1 1/2" less

fig 8 still -

WE move the Transformer
away from the steam
pipe to see if any diminution
of spluttering, ⁱⁿ still throbs 1 & 4
but lights are on now.

WE HAVE ^{just} _{now} ^{made}
1 2 3 4 5 6 7 8 + 9 ^{10 + 11}
wires served
with tin foil & grounded
8 & 9 are lead covered cables
ditto 1 & 2 + all grounded

Moved magnets away from
steam pipes no diminution
of throbbing +
served the places numbered
but it lessens it some + is

Jaculian can see light spots
at several places, in a throw
of 3 inches - Jerry says no
him only spluttering on
shows - all the lead
coated wires has lead
grounded -

Cutting light line out
building makes no
change -

grounding the vrow of all
the transformers no
changes -

We changed the direction
of connection of 6 cell
filament battery

37
This immediately stopped.
The several mirror images -
& throw came way down
to $\frac{1}{4}$ ". With NO Audion
input closed, Jerry
says very quiet in
Phone -

We now Reverse filament
battery 6 cells on NO 2
audion -

Mirror spot Perfectly
quiet not a stir -

The Audion now is well
audion amplifying

Can't understand why
Reversing the 6 cells
of filament battery should
destroy amplification
+ also throbbing -

38

It does not amplify
only $1\frac{1}{2}$ swing when
phonoplex 1" away
which is same
direct,

The old way is 6 cell battery
has neg to filament
where big battery
has negative -

As we have it reversed
we have positive to
filament where neg end
of big battery is connected



Western Elec Coils

Primary 2.65"
Secondary 1800 ohm

Note ↓

$5\frac{1}{2}$ throw at 2" is
best we ever had
See page 12

4 grid circuit.

89

We now reverse battery back
to old place (6 cells) -
on 2nd audion but
keep it reversed on
101 Audion.

We get 10 to 12" on 1"
away of phonoplex
 $4\frac{1}{2}$ at $1\frac{1}{2}$ inches
away of phonoplex
 $4\frac{1}{4}$ at 2" away
of phonoplex. with

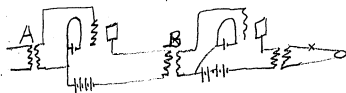
40
4000 ohm resistance in
2 spots in final transformer
primary - The Res of
primary is so low had
to put in this resistance
to keep battery current
(96 cells) down - This
of course weakens
phonoplex wave
Vengleich =

Ferry just finds 4000 ohm
Cats not necessary he
must have had a cross
somewhere when he had
to put them in

41
to get amplification
one of the 6' cell batteries
must be connected the
opposite of the other
loud holler will cause
nerve ^{nerve} to jump which
should not be -

The input transformer
secondary of action
2" if one of bars
ends of coils touched
nerve goes off scale

fig 9
Possibly a Condenser at X
would give both sides of
the wave, but not more
power



42

Fig 9

If say a Negative wave passes from A
input to the grid system it gets thru to
B. Now B secondary must be
connected so a Negative wave
enters 2nd Audion grid system
to get amplification. If a Positive
wave enters it will not pass
only a general inductive weak
wave may get thru so its
not a matter of indifference
as to how terminals of B

Secondary is Connected to
grid system on a 2nd anodion -

We found that while connected
wrong at B so no amplification
that by Reversing the 6 cells
on filament 10₂ got
amplification + Don't quite
understand this -

When polarity of both of
the 6 Cell filament Batteries
on No 1 & 2 anodion the
way 10₂ happens to have
things arranged that
there was no amplification
got about what 10₂
could get direct -
to wit 1 1/2" when

44

Phonoplex set at 1"

But moment 102 made
polarity opposite on 6
cells of No 2 and ion
got 4 to 5" where phonoplex
2" away, but it was
not very steady -

Monday — 25 June 17

We now have all the wires possible in lead cable (2 wires twisted)

We get at $1\frac{1}{2}$ " phonoplex 7"
2 " " 2"

It's not steady - 2" reading uncertain

We now make both filament & anode Nsg to grid -

2" phonoplex 12"^{or more} Fluorescent
unsteady - When phonograph stopped
gives 3 to 4" flickers -

Then changing one of the 6 filament cells - we substantially increase amplifying

We reverse Secondary in #2
 Audion - it is not quite so great
 amplifying Jerry says very quiet on phone

Very faint hum

Phonograph stopped

Singing 2 to 5 inches -

We now reverse 6 cell full battery on

#2 audion -

Now very little singing $\frac{1}{4}$ " good
 though still started -

No amplification

We now reverse Secondary back
 to original (#2 audion 2 input)

Keeping 6 cell battery same
 though started

No amplification -

We now reverse 6 Cell back to
 Neg to grid

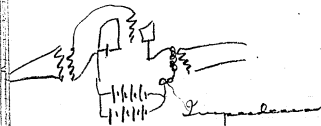
47
Big amplification test ~~unsteady~~
When through stopped swings
from zero to 6 @ 8 inches very
unsteady -

Disconnected buildings by
wire outside - No change -
flicker just same

We now connect each separate
system of induction to earth.
The lead covering is already
grounded. No improvement

We put a shunt around
#1 Audion 96 cell battery

The proper way to stop slight changes of the 100 volt battery from amplifying is to use 2 batteries in multiple - & an impedance in the circuit of the bulb. Then the changes will take place in the 2 batteries & not go out into the bulb circuit.



48
to just as flickery. Shunt passed
20 mil amp -

We now shunt the two helioids (gl cells) to pass 20 mil amp thru the shunt & put an impedance in the line leading to plate in bulb so that any variation in battery goes around shunt & the impedance keeps it from going into bulb circuit
get on 2" phonograph, 1" throat
pretty clearly - at $1\frac{1}{2}$ qst.
2 to $2\frac{1}{4}$ throat -

Fraser

Has 200 ft $2\frac{3}{8} \times \frac{1}{16}$

4600 per ft

also 500 ft

$2\frac{1}{4} \times \frac{1}{16}$ -

4290 per 100 ft

49

Shut impedance on
both audions

Phonoplex $1\frac{1}{2}$ - 4"

throw. used 1800 ohm

W Elec induction coil for impedance

took out + substituted open

magnetic small RR

impedance coils NG

throw with Phonoplex

stopped, several makes
vocal -

WE now put back two 1800 ohm

W Elec Ind Coils closed magct

in multiple making 900

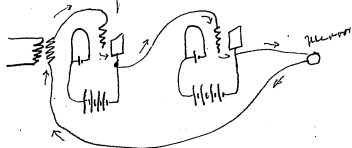
ohm total - done on
both audions

Sheets being on —

get 4 @ $4\frac{1}{2}$ with phonople
2" away — Phonos stopped
flickers $\frac{1}{4}$ to $1\frac{1}{2}$ — Could
work this, notwithstanding
flicker —

We multiple are each set
of helands on each audion —
Double 1500 ohm inductance
in each bulb, plate circuit
Quite steady — Phonople
2" get 1" throw

This might work



and this



51

We now take out the
inductances from both
Aurion's 1800
1800

Evening Monday 25/19.17

We have 1st & 2nd Aurion
Input Coils in sheet iron
boxes, also 1st Aurion
Lamps. — With Phonoplex
2" away get $\frac{1}{2}$ waves
pretty steady — with
Phonograph stopped
swing at most is 1 inch +
Easy — This is very good

We now put second audion
bulbs in iron box

The 6 filament cells both
draw positive to p of big battery



The balance on each audion
is in multiples with 4000 ohm
shunt around the two multiple
batteries taking 20 mil amps -
only 15 mil amp passing to bulbs
in one audion & 10 in
another approximately -

This is Conditions of
Experiment on page

Opened light ckt outside
bldg no change -

53

Both Audions in iron boxes

Almost quiet sometimes for 10 sec
then only a occasional sound
throwing $3/4$ " - phonoplex

2" gives 4" throw already
This is best yet for quiet

Output Coil not yet in
iron box -

Reg Storage Cells on filament
Above is results -

Shunt around batteries
removed - phonoplex clapped

Considerably more unquiet
2 sec zero then sharp jerk
then quiet 1 sec then
 $2\frac{1}{2}$ " + so on

Battery has something
to do with unquiet -
say double -
So we must get a more
Even Resistance battery -

54

on standing phonoplex
gives "little more amplification
about $4\frac{1}{2}$ " swing
steady - but $4\frac{1}{2}$ was
limit 3 steady -

We now put the two sections
of Leland in series, on both
audions - as originally -
without shunt.

It now on 2" phonoplex
swings 8 inches steady -
fairly so - widening to 10"
+ going to 6 - lowest

BEST YET 55

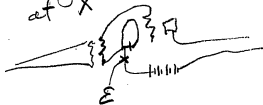
Phonoplex stopped more
uneven than before zero to
3 & 4 inches but most of
the time - zero to 2 @ 3 inches
showing several mirror
spots - showing rapid change
at $2\frac{1}{2}$ " phonoplex

at 2" Phonoplex this is
very practical for
detecting with its
throw of 10" max & 6" min
& steady —

Wz tried a 6 Volt lamp
shunted around 6 Volt

Trouble is
Static —

fediment battery for 56
anderson, didn't do any
good but found mirror
went off scale when he
touched battery — fearing
this static was leaking
in junks we grounded it
at X



This made mirror spot
practically steady at zero
& is an improvement
possibly. not sure

Tuesday May June 26 1917

We changed the Storage battery on
 film units for 200 amp hours demand
 in glass jars - thorough
 stopped ~~the~~ quite unguessed
 goes as high as 16" in the battery
 of Merrow - no spots. - Amplifier 6 @ 8"
 with 2" phonoplex
 This shows that its not filament
 battery -

We put back storage
 Battery -

Phenomena

With phonoplex Ckt open
 Merrow stands Zero
 but moment that
 current is closed
 phonoplex in or out

We get unsteady jumps.

Something Extraneous must
affect the primary coil
of the ~~the~~ Input
Transformer that don't
affect the secondary

It cannot affect the iron
core for then we would
get jumps ~~also~~ by the
action of the secondary

Where does it
come from

§

59
We have it very unsteady.
This pen jerks to 6 or 8 inches
and that pulling 20 or 30
inward Condenser in line. That
it cuts it down to 1 or 2" at
times - & fairly steady
& OK for work at 2"

Phenolphthalein at a time when
flutterm is at its worst.

Why the Condenser does it
Can't say - We put a
ground on primary input
no change but stops
flashes on finger touch

We put the Condensers

60
in right at entrances of
phonoplex skt to input
primary - these small
4" max 2" mostly zero -
Apparently no difference than
when at phonoplex itself -

WZ now put $\frac{1}{2}$ the Condenser
in one leg of phonoplex
Circuit & $\frac{1}{2}$ in the
other, Only $\frac{1}{2}$ " amplification
at 2" phonoplex in this
Case - This is because
The two sections are
in series - hence WZ
gets no ticks on account
low amplification -

61
We now keep Condensers
in series but add to each
lot. to bring up amplification
amplifiers to $2 @ 2\frac{1}{2}"$

Now we put both
lots of Condensers
in one leg or all
Multiple. — Groups 304*

Condensers are of very little
dense apparently —
without these spots are
vibrated by a leaking
Condenser in the lot,

We now take Condensers
out & open circuit
across circuit we put
The Queen Res &
Pencil gal - 15,000 ohms
& see how it beats

Needle Zero no movement
we now start phonoplex
amplifier ok -
No stop phonoplex -
but ckt closed -
Jump - ~~3 or 4~~ 3 or 4"

Now Cut Res to 5,000
then Zero no change

as phonoplex so low in Res

Put coil in series
started phonoplex

10000 no swing

5000 - $1/4$ "

2000 1"

1000 2

500 3

250 3.

Nothing in this —

We now try in a high

Resistance phone in place

of phonoplex - Res 2000

This keeps Mesor practically
Zero, maximum throw $1/2$ " only rarely

90% of the time zero -

Phone 1" away 6@7 inch
Throw -

Replaced phonograph

& put it in primary

Circuit of Reg 108 etc

Induction coil secondary

to primary of input

condenser 2" away

1st nothing when

phonograph running

Reversed 108 Coil put

primary to input coil
& secondary to phonograph

63
no change no throes but
notice flicker just ~~some~~

This being the case
it looks as if the
flicker was composed
of spurts of Very high
frequency waves or it
would not amplify
when Phonoplex fails
to give anything thru
the 10 Elec high frequency
coils - if its high
frequency it couldn't
get thru in relation with
its 3 low frequency

Direct tests without audio

Phonoplex 1" away Throw

1 3/4 -

phonoplex 1/2" away

15 1/2 throw -

phonoplex 1 1/2" throw 1/4"

2000 Ohm phone (Cable & Keys)

1" away 1/4 inch throw -

1/2 " 3" throw -

1/4 " 14 3/4

Flat phone Value 4/10 of
the phonoplex letter at
2" is same as flat phone at
8/10th of inch -

66

Coils, Yet it does not
throw to the Mirror -
or it wouldn't be at, -

Put 5 WEE Coils in
Phonoplex set, primaries
in series or secondaries
in series -

Phonoplex in primary
no throw at 2"
at 1 1/2" got 1" throw
but slight flickering is
there -

We will call the 2000
Ohm flat Bell HC -

Bigest Improvement
yet =
High Resistance
Phone for feeding
Audion, reduces
splutter way down
will rewind phonoplex

67.

We now put HC $\frac{8}{10}$ ths of
inch away from disc on lever
2 audions -

Ampl mostly Zero jumps 1"
now action but peacefully
OK - Throw $8\frac{1}{4}$ = good

Now we put in (in place of
HC) the phonoplex at
2" away -

Phone stopped
jumps low, nearly all in
5" throw up to 8"
Very bad -

Phonograph sw-
wobbles bad but mean
throw not over 8"

Hence HC is 40% of strength of⁶⁸
phonoplex

If phonoplex is 1" away from
disc on lower HC should
be $\frac{4}{10}$ ths of inch to get
same deflection -

With HC in circuit the
spluttering is reduced so it
don't bother say at $\frac{8}{10}$ th inch
Whereas if phonoplex is in
at 2" the spluttering is
several inches

While the real amplitude
is the same there is a

Big Improvement
using High Res. winding
on receiving from sea
phone -

69
Rewound phonoplex each
coil 5000 turns, .002 gage
silk covered Resolam
each spool 2550 shms
Total 10000 turns 5100
shms -

Direct without Audion
gives $\frac{3}{4}$ of inch throw
~~against~~ at $1\frac{1}{2}$ " away
whereas old winding
of 96 shms that we have
been using right along
only gives $\frac{1}{4}$ " throw -
showing big gain by
fine winding. At 2"
away it was a little better
than old phone at $1\frac{1}{2}$ "

We now put Audions on-
through clapper -

Stands ~~at~~ at Zero with about $\frac{1}{8}$ "
movement every few seconds goes to
1" this runs along for $\frac{1}{2}$ a minute
then it starts a jump 4" 2 or
three times then settles back to
nearly Zero. - Very sensitive to shocks

We put ground on 1st Audion
filament where by last connects
that so sensitive to shocks + keeps
nearly Zero =

Now Phonoplex $2\frac{1}{2}$ " away
scarcely any throw -

2" away only 1" throw -
 $1\frac{1}{2}$ " away only $\frac{1}{2}$ " throw

Think we are fooled
in testing direct, as our
Mirror Coil is 2000
ohms & of course a high
phone will give better results
than a low res phone

71
Evidently the input primary is too
low resistance for the high res
new winding

Jerry now discards all the
primary coils, ^{as primary} on 1st Audion
input transform & will
use 2 of the ~~new~~ 6 secondaries
as a primary as they are
very high resistance he
will now connect in
primary coils & use them
~~with the~~ 2 coils - ~~on the~~ coils

No Results at
2 1/2" or 2" away
beats bad when phone
slapped ^{but gives probably} 3 1/2" away

Idea -

Put a low Res Crystal Rectifier in phonoplex circuit so no come back current possible -

Idea 2 - Shunt Whake of the Audion system from phonoplex circuit to mirror (1 sid) + put in high resistance - This stops back wave

also put in 1 battery cell in phonoplex circuit in right direction to stop alternations in primary

72

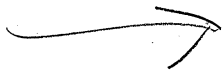
We now put back all coils on NO₁ ^{output} input transformer as they originally were +

We will Multiple wire the new phonoplex winding to reduce Resistance from 5000 ohms to 1250 -

This ought to fit the input coil better than the original 90 ohms -

This when phonograph stopped gives zero 8/10ths of them line now when it jumps to 1 inch. This is a good practical quiet as well

NOTE



73

Phonograph 2" away
gives a very steady
 $4\frac{1}{2}$ inches

BEST & MOST
Practical point
reached yet,

~~It~~ not sensitive to shout
far or walking —

Will hold this for actual
use until we get
something better

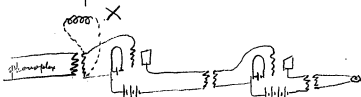
Further Expts -

74

We disconnect both Audion
Lamp batteries ~~which~~ and
substitute freshly charged
batteries. - as Voltage is too
high we put in resistances.
as there is a gas Voltage
& much gas we will see
if its more unquiet than
the old batteries when
phonograph is stopped

Unquiet about same, might be
shade more.
Amplifiers 5" with
Phonplex 2" away

New Expt —



X is a shunt 48000 ohms —

Dead steady when phonograph stopped —

amplification is hurt gives at
2" phonoplex $1\frac{1}{4}$ inches also
dead steady —

96000 ohms amplification 2"

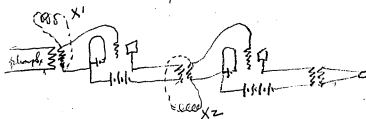


X1 — across secondary & primary

no results same as if it
was not on

Experiment

76

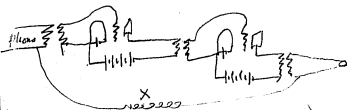


X1 9600 ohm shunt
X2 " " } both across secondary

Dead steady - phono stopped
1" waves. phono running
NG -

Export

77



X is 192,000 ohm shunt around
Audion -

No phonograph - little worse
than without anything
Phonograph giving $4\frac{1}{2}$
NG

78 $\frac{1}{2}$

The Wire used in
shunt was covered
with lead, & lead

grounded -

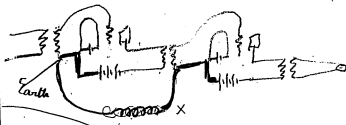
I did not mean to use
this, what I

wanted was

Rubber wire with
the shunt in
well try again.

Expt

78



X 192000 shms - shunt.

Phenomenon - Vibrate perfectly
steadily - needle goes so fast
can't hear it, listening in
phone Edison hears it loud
but dull vibrations but perfectly
even & about 15 to 20 sec

put in 384000 shms - phone
shows waves not quite so
loud but about $\frac{1}{2}$ the number
per second say 8 or 10 a second
we double Resistance again
making 768,000 shms
not quite so loud duller & less per
second.

Static Theory
Busted -

Its Defective
Insulation

Later wrong

Experiment on page 79
74 Continued -

We put a Million ohm. India
ink Res in - ' about same
Edison hears it strong in
phone its about 5 to 6 per
second -

2 Million ohms in - slightly
slower & duller - needle
so far is thrown so peacefully
jerky hears it knocking
against Rubbers - Can't see it
on scale -

Now 5 Million Ohms -
Edison - hears it still now it is
very fast 5 or more second

Expent on page 75
Continued -

8d

We now put in 7 Million
Ohms -

Edison Cant hear it
Jerry says he hears it
strong & its much
faster -

Needle mirror jumps
all over scale from end to
end - see spots.

See page 76 $\frac{1}{2}$ left side
for explanations - we
been using lead covered
wire grounded, what
I intended use was
Rubber wire & Resin

81

We try Experiment over again -
Using a single rubber
Covered wire and
7 Million Ohms in
circuit. Connected as
per diagram on page
78 -

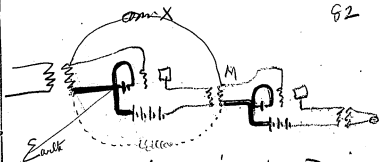
Now 7 Million on Edison hears it

See diagram page 78

Only get it in phone when the
wire shunt is touched
wire ^{one} on the black lines -

If shunt is put there

If Coil M is resonated
don't get vibrations



Shunt here, nothing heard in
phone.

But shunt shown in dotted
lines, we get the very strong
vibrations, which have
varying rates of vibration.
Parks gals vibrates $1/4$ to $3/8$
like a Reed - Its an
oscillation -

Any leak in the Coils or between
the black lines of NO 1 & 2
Audion will cause these
oscillations & violent movement

Note = These Expts may
have been affected by
the ground as shown
in diagrams on pages

78 + 82 -

We are testing to see if leakage
between primary & secondary
of No 2 audion -
after that will make
the Experiment over
with ground off

63
of the Mercur so nothing can be
seen of it with 5 Million ohms
in - with 7 Million Mercur
vibrates full length of the
scale regularly & shows
spots of light - as rate of
oscillation is not in time
with the Mercur time -

Jerry measured insulation
resistance between primary
& secondary coils of find
its more than 11 Megohms
probably 50 as his instrument
cant go above 11 -

We now put shunt from
black lines of diagram
page 82 with ——— Megohms
+ Remove ground
wire which was on in
other Experiments -

Cannot repeat any
of the Experiments
only get high rates
through 1 Megohm
Something must
have changed
we now Take off shunt

85
+ Make reg test phono
stopped & detuned 2"
phonoplex —

Phonograph stopped grunt as before.

Can't get anything with
the shunt of 1 megohm —

We now reverse the primary
of No 2 audion as Jerry in
testing for insulation is not
certain he put it back
the same way as we got
the big low rate vibrations
got the slow again^{vb}
took ground off still

get the Vibrations, & proceed so
makes no change -

Jarred Every iron box still
Vibrates -

It seems that the Current from
the Secondary of 2nd induction
or rather the Voltage returns
on shunt to Secondary of
No 1 induction which amplifies
it passes it to No 2 secondary
& that the 8 or 10 Vibrations
are the resonant times of
oscillation - While
we get Current in the
Magnet, I think we only
get Voltage in shunt

Our Mirror always
stands N + S ~~8~~

87

We put the Paul in short
without any resistance
the needle never stirred
Yet if put in at Mirror it
vibrates $3/8$ - looks like
Wattles. Voltage was transferred
across short - & this
through. 2nd Audion was
turned into Current.
We now increase the Magahm
to 12 million ohms -

~~Watts~~ Edison hears low steamboat
whistles - Started phoning
it don't amplify more than
1 inch - hence short work

88

amplification, when 12 Megohms
leakage 12 Megohms
don't effect mirror only
little vibration Zero + $\frac{3}{4}$ "
at time -

We not put in 10 Million
Steamboat whistle
louder ~~and~~ mirror
not much not affected
18 million
~~at~~ every say, its broken up
a little. now a mirror -

Vibrate very rapid ~~about 3"~~
~~about 3"~~ off the scale -
6 million -

Note getting lower -
needle wild -

~~at~~ 4 million

Note now a flutter 6 to 8 sec

430 am We know a ⁸⁹
considerable more than
we did & we will now
go home

Wednesday pm

Test of App - Open steady -
Closed - 90% of time Zero -
now & then $1\frac{1}{4}$ but went $2\frac{1}{2}$
good practical Zero for
reading 1250 ohm phonopex
at 2" gives from $2\frac{3}{4}$ to 4"
 $2\frac{3}{4}$ lowest reading

We now try high volt battery
substituting Storage Cells
for the Leclanché we have
been using -

90
We put Storage Bat - 52 - Cells on
No 1 Auction

Zero after 1 min is just as good
as Lelaude - 1 8" jump + then steady
phonoplex 2 to 4" no return to Zero
practical - average $3\frac{3}{4}$ -

Now we change Lelaude on #2
Auction find substitute storage
batteries

At first Zero poor - in 2 minutes
Zero about same on whole
Auction as with Lelaude,
Think a little worse
Amplification 2 to 4 -
never comes to Zero

Think Storage Battery
giving same Voltage
will be OK in place

of helands but each individual⁹¹
battery should rest on a petroleum
insulator -

Only $1\frac{1}{2}$ to $1\frac{3}{4}$ Mil. amp through
the 3 lamps at present

We now will add battery
to get thorough regular
amount which is
30 Mil. amp or 10 Mil. amp per
lamp - 3 lamps being in
Multiple on each andion

Now 69 Cels. on each andion
or 82 Volts - 30 Mil. amp
for the 3 bulbs -

After on 1 min Zero is good
now when goes to 1" - but good Zero

phonograph started,
 5" swing don't fall below
 the extra battery improves
 amplification,

Evidently with the number
 of cells we have now - The
 Storage Battery is OK -

Side Experiment, as additional
 cells improved the amplification,
 we now add more to see
 how far we can go & get
 a steady zero -

Now 138 volts 30 volt amp -
 114 cells 2000 ohm resistance in
 series No 1 Audion -
 No 2 audion series cells & Res

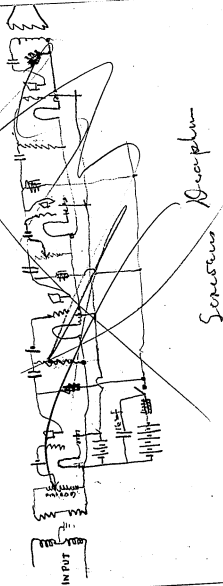
24/6/40 ~~Phonoplex working 1" swing~~ 93

Zero perfect,
phonoplex working 1" swing
The tuning down resistances in too
much - The resistance is too
much as it loses simplification

We now remove resistances
in battery - this gives
138 Valt across Electron
gap - on each Audion

Zero 25%, 50%, within $1\frac{1}{2}$ " &
25% 2" swing - occasional
6" nat after -

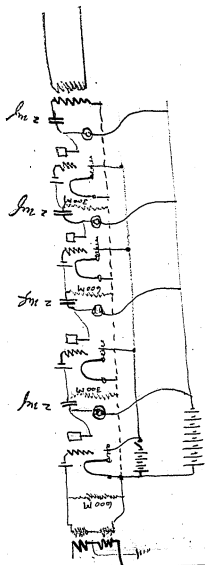
Swing after starting
Phonoplex $8\frac{1}{2}$ "
This is practical but



94
 on account of the poor zero
~~the~~ if the current or signal
 from the sea was $\frac{1}{2}$ the
 strength, the flickering zero
 would make it uncertain

Could we get a zero within
 1" max (knew + 80% zero)
 could read signals $\frac{1}{3}$ rd
 this strength with certainty

Our big Coils - Each
 Secondary coil 918 ohms
 Primary Each 4.03 ohms
 connected Primary 24 ohms Secondary 5500 ohms
 No. 1 #2 addition Output
 coil - 11.015 ohms Each



All Leaps Multiple - 1 Colony -
 All the grids split into multiple one
 In fact to only one section that
 like each current equivalent

95
 We now have received an input
 an output coils from American
 Transformers Co. -

The resistance of ~~primary~~ ^{primary} output
 which has ~~17~~ ¹⁷ coils is
 - 1875 ohms - per coil - total 22500 ohms

~~Coils for primary~~
 Secondary 12 Coils
 Resistance same

Even if all the Coils of
 primary were in multiple
 the Res would be 156 -
 ohms -

This Coil seems to be
 wrongly calculated -
 or else our 4.05 ohms
 coil use here is rotten -

Test =

96

Same Conditions as usual
Phonoplex 2" away
Storage battery, 138 Vatts
Each condition - battery
grounded on #1 condition -

Phonoplex in 1" throw
Stopped - perfect Zero -

Tried only 1 bulb - got no swing

Now 7000 ohms in primary
15000 secondary
13 mill amperes through to
grid -

Steady Zero OK -
Phonoplex going 2" throw

We now change to

94

7000 primary + 7500 secondary
gives about $2\frac{1}{4}$ throw

We must open coil ends to
get it handy for various
Concentrations - as coil is NG
now in its present condition -

Res of primary 155 ohms
secondary 153 -

Zero point, keeps about 2" + less
with an occasional throw of
4 to 6"
amplifiers to 8"

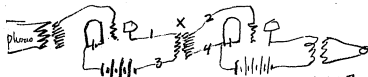
We now double the

94

Res of primary leaving
Secondary the same
Zero 50% well $\frac{1}{2}$ " 50% 2"
a jump now & then to 3"
Throw about 8" —

The Nernst Coil is the best
& there is no gain in
this coil — it is far more
costly & complicated —

While new coil is in
we try a special experiment



WE Remove Induction Coil & put 1 & 2
together + 3 & 4 —

Result —

99

Perfect Zero

Amplification $\frac{1}{4}''$ to $\frac{1}{2}'' =$

probably if phonoplex was
set at $\frac{1}{2}''$ it would show
something better —

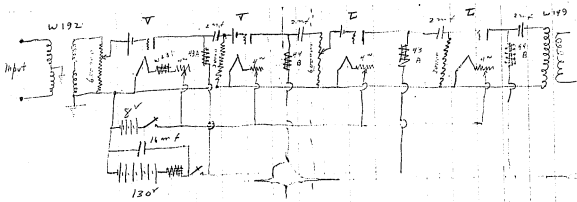
When put in ~~under~~ ^{the secondary of capacitor}
across ~~the~~ ^{the} phonoplex at
1" got 15" throw —

Shocking WElec multiples
are played not so good as
our separate system —

WE now removes the
inductance ~~system~~ across
line —

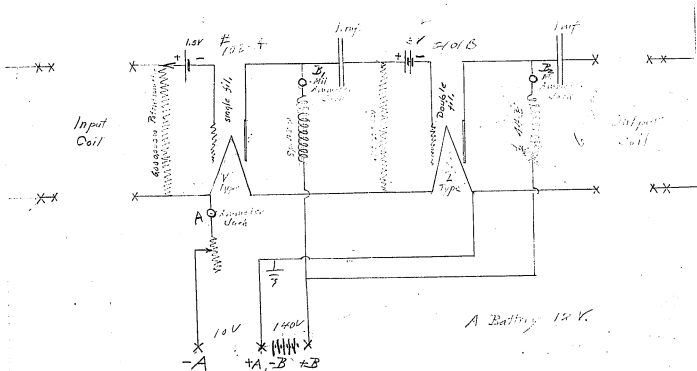
It gives 8" throw —

[ITEMS(S) FOUND IN BOOK]



[ITEMS(S) FOUND IN BOOK]

Special Amplifier



Notebook Series -- Notebooks by Edison
Notebook, N-17-06-28

This notebook is a continuation of N-17-06-14.1. It was used by Edison in June-July 1917 to record research on amplification for the U.S. Navy during World War I. This work was probably done in connection with Edison's attempts at aiding submarine detection. There is also one entry by Jerry T. Chesler. Included are diagrams and descriptions of experimental amplifiers for detecting sound, along with notes regarding their performance. The components involved include audions, induction coils, batteries, condensers, phonoplexes, and mirror galvanometers. Some entries refer to work in earlier books in the series. A final entry summarizes the best amplifiers using one and two audions and concludes "Now for a good Carbon Telephone." The experiments are continued in N-17-00-00.8 The front cover is labeled "U4." The book contains 100 numbered pages; pages 94-100 are blank.

17-06

Thursday 28th 1917

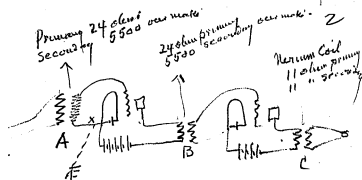
WE now go back to our
Reg series plain—

+ Try out the new input
coil furnished by the
American Transformer Co

The Output coil is a
failure



phonoplex 6 Waves second
 Phonoplex surround 2 coils
 Each 2500 ohms each
 but Multiple Res 1250



3 bulbs in Multiple arc on each
 Audion

Transformer A B+C in iron boxes

Audion bulbs in Iron boxes

5 Cell filament batteries in iron
 boxes -

130 Cells Storage Battery
 on each Audion -

battery boxes set on glass
 Insulators

All iron boxes on glass
 insulators.

Note

all leads twisted & covered
with lead. Each lead
sheath grounded

One general ground out

X -

Phonoplex 2" away,
gives 8" throw which
throws to 10 @ 11 -

Zero - 25% Zero 50% $1\frac{1}{2}$ @ 2"

25 2 to 4" with an
occasional jerk to 6"
but not often -

Zero has tendency to
go to $2\frac{1}{2}$ " for phonoplex
yet expert could detect
6 V.C.s.

4
As degree of amplification
Comes down the Zero
gets more steady —
With 4" amplification
instead of 8" The Zero
is OK keeps 50% Zero + 50%
within 1" —

The thing to work on
is a better phonoplex
+ Absolute Insulation
of the system — if system
had a constant insulation
resistance between all
of 10 megohms Zero would
be Constant

5

The Miras works perfectly -
 have worked with one
 mirror 2 weeks without it
 once getting out of order
 of requiring any adjustment
 During all this time
 we have used a phonograph
 kept wound by a
 motor ~~or~~ giving 6 waves
 per second, the Milamp on
 directing mag always in
 the same when in
 tune, (ie) keep Milamp
 constant & tuning never
 changes -

The arm of phono has 1 bell

Amplification is diminished
by diminishing cells on grid
plate & zero is more steady -

If amplification is too great
Can short mirror spool
or diminish battery
on grid plates

Insulation can be improved by
use of pure rubber or gutta
percha wire leads if necessary

diaphragm only

American Transformer Co

Input Coil -

Primary 5 Coils 2.5% ohm
Each - Total 12.5% ohms
Total turns 1050

Secondary

14 Coils - Each 1600 ohms

Total 22 400 ohms

When in Series -

40 to 1 Total turns 42000

This don't give us any
chance to make many
changes on primary
but does on secondary

	Rev/Sec	3 Sound
80 Rev/Sec approx	1.33	3.99
90	1.55	4.5
100	1.66	4.98
125	2.09	6.27
150	2.5	7.5
200	3.3	9.9
250	4.1	12.3
300	5	15
350	5.83	17.49

We are OK on present mirror
gals if each paddle gives a
Sound

But if only 1 sound per revolution
Then 200 Rev/min is lowest
we can work present mirror
to go to 1.33 per second must
make an astatic needle
mirror gals

Think this Coil is no advantage
over a.c.s. except better insulated

But it lacks in Mass of iron
that a.c.s. has —

We now connect up the
New Input Coil of the
Amen Transformer Co —

gives very bad zero from
2 to 10" jerks —
but finally settles down
to 2" zero with jerks quite
often of 10"

Setting phoneplex
away $2\frac{1}{2}$ " gives
good steady throw that lens

than $5\frac{1}{2}$ inches - Band
 would be unmistakable
 from the sea as to waves.
 The throw is steady but
 shows lots of tight
 spots.

We now have Amca TC
 Input on A01 and on -
 ours on input for A02
 Audion & Vernier
 for Octal - ground
 wire at #1 Audion off -
 jumps off scale - put

9
ground wire on - ~~is~~ not
quite as bad but jumps off
scales - we also at same
time took off each
Anderson 1 Tray of battery.

As we cant get any test
on account of the Zeros being
bad we will shoot the
Mirror + see if we can
read the phonoplex

(High humidity today 80% relative)

High humidity would delugment
the RCH on battery boxes
which would be dry in
low humidity -

100 ohm filament, bad Zeros
2" phonoplex - cant read

We now keep shunt 100 +
 Retrophone 1" away
 get good Zero - with ~~100~~
 10 ohm shunt across
 galvanometer Mirror
 Phonoplex 1" 12" throw
 " at $1\frac{1}{2}$ 2" throw -
 with a fair Zero ~~at~~ 80%
 Zero, no action $1\frac{1}{2}$ " jump -

Now 10 ohm shunt
 Phonoplex 2" - Cant be
 over as it sometimes
 comes to Zero at most its
 not over 1" The bell
 phone is in ckt with

Mirror sheet around ^{mirror} ~~back~~

WE now put sheet of
10 elms around mirror

~~only leaving phone~~
~~in between sheet &~~

phone - not so good
as around the mirror

only - Can't be sure
of $1\frac{1}{2}$ phonoplex -

get 2 @ $2\frac{1}{2}$ steady this
would be OK -

Phonoplex $1\frac{1}{2}$ fair
Zero + 4" strong good
+ steady -

We now put a Mica Dea ¹²
on the lever worked by the
arm of Disc Phonograph -
by shortening the mirror
will 25 to 50 ohms to
get a zero that we can
work with. (Zero now beats
all our whole scale)

We put a reg bell
longphone in front
of lever with mica
& can get off scale
at 3" at 6" to
10 to 12" & at one
for 3 or 4" but

When we oil the wheel
It goes way down to
almost nothing oil
6" away showing
the 6 vibrations are
due to Knock of
Roller on Cam wheel
I have always been
doubtful if vibrations
of 6 per sec. went into
ear as a sound
waves I think it
don't & this helps

14

to confirm it - possibly
it may but it is very
weak like a fork
as there cant condense
to any extent as it
goes around the thin
disk -

We now put the 1250 ohm
old phonograph & iron disc
back set it $1\frac{1}{2}$ away
shunted hummer with
50 ohm to get a
zero workable - get
5" deflection -

Now we now diminish resistance
in filament battery of each
cellular - 5 convulsions of
spiral on ~~substant~~ Res -

About the same or 5" swing -

Made 5 more moves on
Resistance - $2\frac{1}{2}$ @ 3" swing

Made 5 more moves -
give $2\frac{1}{2}$ deflection.

Made 5 more moves -
give 2" swing - yellow red

Now we put it back to original
& cut out 5 convulsions -
bright yellow red - 1" ¹¹
Swings 6"

With 5 more Res convulsions
6" or should be less -
full battery on - no gain

16

We now remove $\frac{1}{2}$ of
the grid battery on each
auction to see what it
does — (Mirror cells)

get 2"

for last 2 weeks we
have been using —

U18 — Mirror —

We now put in

U14 $\frac{6}{32}$ length
fibers 10 needles

NG Cant get zero
with Scandah open ~~~~~

18

We put in U6 2 needles
This is very sensitive to freq

Note = Evidently

U18 is unique in being
insensitive to shock -

We shall probably have
to make many duplications
to get good ones.

Can't do anything
with U6 -

We put in U5
2 double length needles
Jumps horrible

19
U19 in now, fibre abraded
with 1 gram 5 needles -
tuning 37.4 delay

U24 is nearly as steady
tuning 26.1 about - light too
big = 4 at sample

U25 -
tuning 32.8 about
steady like U18
good light -

U26 - light big ~~good~~
pretty steady not as good as
tuning 37.4 about

U27 = light large round
 Very steady - as good as
 U18 Tuning 60 - not very
 sensitive find out what
 difference is between
 this & the others NG
 as compared

004

We now try an Experiment
to get both sides of the
wires.

OK should not
be made off



Lamps seem only
good.

$\frac{1}{2}$ "blow" -
1 "blow" -

50 ohm sheet on
menor $\frac{1}{4}$ " blow
100 ohm sheet 1"
100 ohm 500 ohm

$2\frac{1}{4}$ " blow
100 ohm 3" blow
no sheet 4" jump

should not be marked. 77
2 batteries now put on
Multiple arc.

Moved off by mistake -

Now 2 batteries Multiple
arc

$1\frac{1}{2}$ " away Phonoplex
50" ohm shunt $\frac{1}{2}$ " throw
100 " " $\frac{3}{4}$ " "
500 " " 3 inches "
1000 " ~~2~~ 4" "
No shunt 6"

Phonoplex 2" away

1000 ohm shunt $\frac{1}{2}$ " throw ~~no~~
~~but~~ ~~zeros~~ ~~now~~
then probably $1\frac{1}{2}$ zeros now & then

With a steady Zero the
waves at 2" away of phone plug
would certainly exceed 1" if
not more,

This shows both sides of the
wave is certainly a great
advantage,

As the film battery is a little
low we now change for
5 new cells on each -
using 3 bulbs on a side

2" Phonoplex 24

500mm Shunt	Throat
100 "	$\frac{1}{16}$ " inch
"	$\frac{1}{8}$ "
500 "	$\frac{3}{4}$ "
"	"
1000	$1\frac{1}{2}$

Open no shunt
 a Zero naco + then two -
 Shaky Zero to tell -

Multiple among battery no advantage

Multiples 8 to 1 -

instead of $4\frac{1}{2}$ @ 5 to 1

with 1 single audio -
 against 1 audio double
 wave -

Note

We replaced B. 2

Note →

data - The reason
of good zero is
bulbs have very
little amplifying
power
Sensum says
20 test pairs

25

Section bulbs for Reg
ones we been using
at $1\frac{1}{2}$ " got $2\frac{1}{2}$ inch
thru already -
at 2" got $\frac{1}{2}$ steady
ZERO is fine on these
bulbs -

We now put 5 bulbs in
each section of 1 amp
It will require considerable
film battery to run these
5 bulbs - it smokes
the circular porcelain

Coil so was put in 3rd
 4 ft of heavy resistance
 were in battery circuit
 supplying film.

Brought lamps up so
 bright red with curtains
 down not yellow red

It is 1" across at 2" ^{phosphor} kept
 its uncertain as I get a
 zero after - ~~Heck~~

~~3 better than~~

~~5 of that type of bulb -~~

~~3 better than 5~~

Think 5 better than

3 -

There is some doubt about
all these double Audion
Experiments with B2
Lamps, & also old
Lamps, I found when
lower audion double
was in & upper
audion was working
got amplification but
when bulbs cut out
& lower audion
bulbs cut in got
nothing & had to
put in 1" phonoplex

28

+ then it was less than
direct,

Both in phenol 1"
get $5\frac{1}{2}$ throw -

only 1 in. $3\frac{1}{2}$

Old Lamps - put in -
No 1 $\frac{1}{2}$ " No 2 and in $3\frac{3}{4}$ "
No 1 $3\frac{3}{4}$ -

Both together - 4"

Coils must be wrong
we ^{have} ~~lost~~ No 1 & mess
penny as No 2 and don't
do anything.

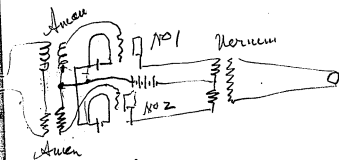
Both in Coil put back
4" swing -

We now have received from
Amen Transformer Co another
input coil which is a
duplicate of the first one
got from them -

We put this in place
of ~~the~~ our big one -
using still the Herman
Coil for output

30

with the Duplex Section



Phonoplex 2" away
 This shows a swing of $\frac{3}{4}"$ on
 No 1 + $\frac{1}{2}"$ on No 2 when
 Separately Operated —
 No hunt on menors & very
 steady Zero, a satisfactory
 Zero, When No 1 & 2
 are operating together
 we get 3" steady waves

Notes

31

This is high water Mark -

One Auction (Duplex)

3" swing when Phonoplex

2" away with a steady

Zero - it seems double loose throws
need more than double

Note that Zero becomes steady
when our coil cut out
& Amen put in place
probably showing less
leakage -

We now add the Amen
Transformer Co's Output
Transfer in place of Heriums

Zero more unstable - with
2000 ohm shunt on Wena
get 3" throw - at 2" plowley

We now disconnect the Duplex
& Connect for 2 separate
Audions in series the
old & Regular way

The Zero is so bad even
with 20 ohm shunt
Can't tell anything
in any event it

don't seem to be any better
at 2" ~~plowplex~~ than a
Single Duplex

10% have not got the
2 input transformers
in iron boxes & they are
only 3 ft apart &
stray lines may be
cause of mutual
inductance, 10%
now move #1 and iron
input coil in the
other room - ~~to~~
25 ft away from

#2 Input -

Just as bad a Zero
horrible -

Multiples are all
primary coils in
Output transformer

Horrible - big
roar in phase -

2 @ 3 Megohm
Creep leak -

35

Thursday July 5 -

Test with 1 set of 3
Audion Bulbs to determine
best Connection on output
Transformer All primary
coils in multiple all
secondary coils in multiple
gro quite steady 80% of time
almost still rest of time
deflections not exceeding
one inch.

~~not running~~

Throw at $1\frac{1}{2}$ " phonograph

from 2 to 3 inches

With Primary coils all in series and secondaries all in series zero is 50% of time $1\frac{1}{2}$ " throw 50% between 2 to 4 inches.

Throw with Phonoplane $1\frac{1}{2}$ " away 8" to 10" -

with Primary ~~in series~~
Coils all in series and secondary coils all in multiple get zero 80% of time almost still rest

of time. deflections not
 exceeding one inch -
 Throw with phonopiles
 $1\frac{1}{2}$ " away 2" to 3"

with Primary Coils all
 in series and secondary Coils
 in series multiple Zero.
 Zero goes practically all
 the time from $\frac{1}{2}$ " to $3\frac{1}{2}$ "
 Throw with phonopiles -
 $1\frac{1}{2}$ " away steady about 4"

with primary Coils all
 in series multiple and

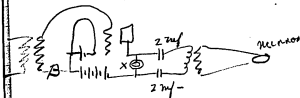
Secondary Coils all
in series multiple.

get Zero 70% of time
about $\frac{1}{2}$ " movement and
rest of time two to 3 ~~to 6~~
inches.

Throw with shroudes -
 $1\frac{1}{2}$ " away 5 to 8"

A New Experiment

39



With this at 1" away of phosphor
get steady 9" throw and
1 1/2" phosphor away get
steady 2" throw - Zero
perfect. The idea is to
keep current of 100 cell
out of coils -

X is a impedance 1800 ohms
being secondary of Elect. Elec
phone coil & gives only 2
milliamperes then to
Bulb -

We now measure the
the microfarads to 4

Microfarads on a side

This increased the thickness to 3" but it was a shade unsteady beat from 2 to 3' but ok —

We now add another WE Induction Coil at X to increase voltages to the bulbs from 8 to 16 probably — This don't increase thickness but actually reduces it to 2" instead of 3" with one coil

We note with this
arrangement

U25 requires 56 milamps
to tune to Phonoplex
Disc running 90 Rev

41

We now put the 2 coils
in series -

This increased the
tension to 4" but
~~was not enough~~ The
Zero is 0.4 to 1" -

only 2 ref on each side
get 2"

We now now put each
make it 4 ref on
each Condenser -
gives $2\frac{1}{2}$ about (not 4 as it is)
^{gives some}
We now put 2 ref
at B - (page 39)

gives $3\frac{1}{2}"$ Zero is not
 good goes from 0 to $1\frac{1}{4}"$
 quite often, & would be reaction
 with 2 series induction -
 although probably OK
 for a duplex induction

We now put 3 Westinghouse
 induction coils in
 series at ^{page 39} X making
 5400 ohms induction
 gives $3\frac{1}{2}"$ but still Zero
 not good enough 0 to $1"$
 opened coil circuit X
 got nothing. —

We now cut battery from
104 to 52 we get
 $3\frac{1}{2}$ " —

We now cut the battery
down to 26 cells.
get $3\frac{1}{2}$ to 4" Zero side
not good 0 to 1"
gives 3" Zero not good
0 to $3/4$ " —

We now put on 6 cells
only instead of 104 cells
on Reg —

gives 1" Thrax —

We now cut out 1 coil
of the 3 in at X

Still 1" throw -

We now put on one box battery
26 cells - Zero 0 to $\frac{3}{4}$ "

2 boxes but in Multiple -
 $\frac{3}{4}$ " throw.

now 3 boxes in Multiple
78 cells. throw 0 to 1" -

nothing gained here
Don't think battery
has anything to do
with bad zero as far
as bubbles or change of
Rev is concerned.

We now connect all
the batteries 104 loops
but Reverse them

Putting P to Lamp &
 Negative to plate in cells
 to see if any current
 goes through -
 get nothing - Zero
 perfect, This is as it
 should be - We put back
 with regular & already
 Zero is just as good with
 104 cells as with 6 cells -
 This is singular - It
 may be the Lamp after all
 that the Cails -
 possibly five pieces of
 Platinum are spilling off
 irregularly & carry away

Change - of side of nickel &
metallized nickel -

We now with 104 cells on
& Condensers at B. 2 mf -
& 4 mf each side of

primary of ^{output} ~~take out~~
coil - ~~substitute~~

the W.E. Electric Conden

~~for~~ & put in one of our
old condensers on
each side, 275 @ 3 mf
~~works about same~~

We lowered bulbs by using
only 3 cells but
only $\frac{1}{8}$ " throw Phonograph
 $\frac{1}{2}$ inch

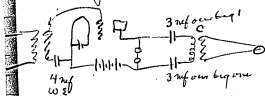
We now use 4 Cells which
is all we have used
since page 39 -

Make another
change - to wit
~~increase~~ Microfils from
2 to 4 at 13
(page 39) -

Zero 0 to $\frac{1}{2}$ - throw-over
 $1\frac{1}{2}$ " but it zeros now &
then. —

Same old trouble
with Zero -

We now use one of the
Amert Co's input coil
instead of their regular
output coil to see if
we get a better zero



C is an input coil used instead
of their output,
nothing at 2" phonoplas
" 1 1/2 "

We Reverse it & put primary
to Mirror & secondary to
Condensers as secondary is
very high resistance

8" Throw is best ^{we have} got
with 2 series
inductors =

Zero Varying from
0 to 1" throw -

49

Get nothing - Calculations
not right. something
must be wrong

Data of Iron Transformer

Input Coils 210 turns primary
per coil

~~Secondary~~ 5 Coils in
series 1019 wire -

Secondary 14 Coils -

3000 turns each 34 wire

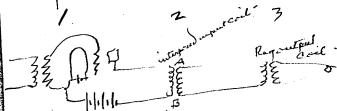
So far we cant get anything
through an interposed
(Input) Coil as made by ATCo
this being so, it seems strange
we should get anything
when its used as an
input Coil for a second
audion \equiv

Expt on page 50 shows
its too high in resistance
making secondary
 $\frac{1}{4}$ of the resistance
gives

July 6th 1917

58

We now put the interposed
Input Coil in an iron box $\frac{1}{4}$ " thick



get $\frac{1}{4}$ through —

We now divide the 14 coils of
Secondary of interposed input
Coils A B into 2 sections —
& multiple arc these to
bring down the excessive
Resistance —

We get 2" with phonoplex $1\frac{1}{2}$
input Coil for a
second audion is
to high resistance.

the iron box ~~at~~ we put
 the AB coil in has stopped
 entirely the loud vibration
 we got last night by
 putting wires at A or B
 across from secondary to
 primary -

We now put both input &
 intermediate coil in
 iron boxes $\frac{1}{4}$ " thick -
 $1\frac{1}{2}$ phonopy all coils in
 1 2 + 3 2" throw

We now cut ulonmedeale Transfer
out a have plain Auction

No grounds on lead sheaths
anywhere - $1\frac{1}{2}$ phonograph

12" Wires 2" phonograph 2" @ 3

Zero 0 to $1\frac{1}{2}$ "

We now have a Magnet
4 gal made in England
for testing in Megohm
resistance of insulation

• will test our
Coils & apparatus

Two poles of tester #1 test
 1 to ground Jerry's body to dry
 floor 5 @ $\frac{1}{2}$ Megohms
 Harkon 2 $\frac{1}{2}$ "
 Burren 4 "

#2 both primary & secondary.
 Output Coils to tester, 1 pole
 Iron Core - 2nd "

tested twisted rubber covered wires
 leading to transformer before
 connecting to it - is Nothing there.

Now Connected - using a
 separate wire one for
 Core & one for Open C.C.
 on transformer -

Instrument shows nothing
 (10) in excess of 40 megohms
 measured infinite -

Now Jerry puts a telephone in
circuit with the Tester, & coils.

Jerry hears at a time,
hears him of Magnets ~~to~~
~~to~~ some places ~~near~~
all over about 30 to 150 ft.

Use separate Coils -

Put primary coil & frame
together then Tester,
same thing, ~~the~~
Transmitter in telephone

Now put secondary
to frame & Tester
same thing -

Disconnected 1 end
of telephone, Hum much

weaker ~~than~~ + AC and Vibrating
almost gone -

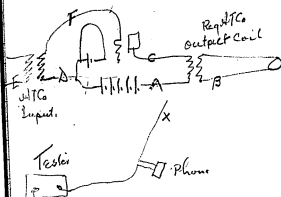
We now try the Maximum -

Spools or Coils - ~~not~~
just over the mechanism -

~~Between~~ between the 2 sets
of Coils, infinity -

Output Transformer
between the 2 coils -
just below infinity

Both Input Transformers
are about the same
just near infinity



E.

We test A B C D E by putting wire X at these points.

Before starting we test system
 $1\frac{1}{2}$ " phonoflex throw is. 10"
 zero 0 to $1\frac{1}{4}$ " -

Now X wire put at A. phonoflex
 Reaching zero 0 to 2" get the
 hums & occasionally a blue
 hum
 & needle goes all over the

Leads showing spots
 there is there on the Spits -
 he hears plainly & its these
 spits that works the needle
 violently -

Now at B, get same spits -
 needle goes 10 @ 15 - but don't
 show so many spots & not
 so violently agitated -

Now at C needle nearly
 with 6" shows spots from
 says phone not so strong
 for spits -

Now I needle way off
 scale spots galore Jerry
 Daps - great many more
 spots & louder

Now E needle at 1st went
 clean off then rolled
 down to 6" showing
 spots not frequent
 Jerry Daps at 1st
 still very powerful
 spots, then weaker
 like previous trials,

Now at F needs off scale.
all the time - Jerry says
strong spots, comes in
lots of 3... 50- per min

This all seems to prove
that the trouble is the
Bulb, that particles
jump over carrying heavier
charges than the electrons

Ringung tester between
grid & plate - gave as
low as 8 megohms
when taken out of socket the
resistance was infinite - therefore is

the lamp filament is not
lighted but cold - all these
sparks are away from audience -
Another lamp gave
infinite -

The one that gives 8 meg has one
of the wires loose on the
grid. -

Tried one of the V lamps
has resistance over
40 meg ohms -

We now take battery of
the 3 regular Audion
bulbs & test resistance
of the 3 in parallel

the test is Cold filament

Its just below infinity
 Jerry dont hear anything

Except deep hum

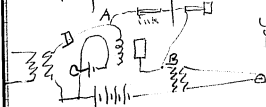


fig 2

We now without Megger put
 a shunt around at A + B
 fig-2 - with a Megohm
 in India Link Pies

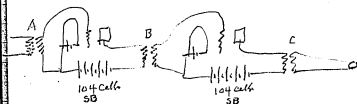
& listen - Whistles -
 no spits - The shunt

diminishes amplifying
 power from 10 Pa to 11 - faint click
 now when this shunt reads

fig 2 we now connect
shunt as C.D -

amplifying power $\frac{7}{8}$ as input
10. $1\frac{1}{2}$ phonograph -

hears nothing on phone -



A Reg ATC input

B " " but 7 secondary coils
multipled with 7 coils making

$\frac{1}{4}$ of Reg resistance -

C Reg ATC Output Coil -

This Experiment is to see what

improvement in amplification,
 we can get by lowering resistance
 of the NO2 Input secondary
 there which when interposed
 in a single circuit we
 couldn't get amplification
 but which when 7x7 coil
 multiplied gave fair
amplification -

Can't get a 2w, vibrates very bad
 even when switch open it
 hums. We grounded lead
 on mirror line, this stopped
 it & also stopped shock to
 fire when one pole of
 open mirror switch touches

regular beats of 80 to 100
 minutes - which not
 coincident with needle
 jump - This all stopped
 when lead sheath grounded
 which acted as a condenser.
 Even finger drew bright
 sparks from open pole of
 Nevros switch -

grounded iron transform
 boxes this made it
 better still so mirror
 staid on scale but
 jumped bad - spots -
 100 ohm ohm Zero
 6 to $1\frac{3}{4}$ " - nothing
 much ~~o~~ coil nearly 62

Reversed - Phonoflex is
2" away - tried it
Very strong high note
whistle, throws needle
off scale -

Use Reverse 5 cell battery
on 2 Audion

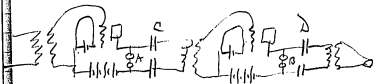
Can't do anything with it
no amplification, -

We now test No 1 Audion
separate, then No 2
separate,

No 1 - goes 10" at $1\frac{1}{2}$ phones
Shunt off -

NO 2 Audion - Throat 5" -

We now put audions
This



A B are 2 WE phone coils
1800 ohm primary in series
C D are 4 mf of condenser
Each — all to stop
Battery passing thru
~~transformer~~ Transformer coils

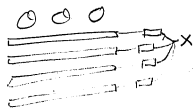
67
Can't get anything to
work except separate
audions.

We now connect No 1
audion as plain
audion & take
everything off glass
insulators —

get 2" brass & bronze
at 2" but its wavy
varies from $\frac{1}{2}$ to 2"
Bad lens still there —

When they lose magnetics
the Helium goes up

Note 25U has been
using lost its magnetics
from violent knocks
on holder due to
heavy currents went
up beyond 100 mil amp
to 1000



Connected all the lamp
strips through under
ink Res 1100 - got
6" swing $1\frac{1}{2}$ ft complex
Zero not perfectly steady
0 to 1" generally less -

10E now connect the
Ends X to Earth -
no advantage, lead
Zero -

U25 lost magnetics
put in U26

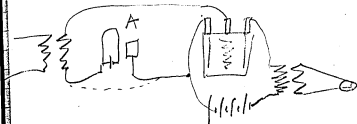
Its ok 2" phonoplex 2"
It now minimum goes to 5"
but Zero is bad with
without the India ink
Res now removed

We now discard all
lead covered wire
use twisted rubber
Ends at both ends
connected & used
as 1 wire — no gain

We now Connect No 1
 Induction Input so its
 Secondary has $\frac{1}{4}$ of
 the resistance reduces
 the swing from 10"
 to 6" but the Zero is
 no better in proportion

Put Mirror ckt right on
 secondary - no bulbs
 Phonograph 1" away
 get 1 inch throw

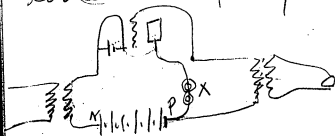
We now try a grid condenser
I have made - 20 sheets
about, 2×4 with grid
like Center Electrode



First test is ~~with~~^{with} A Audion
lamp which is for
purpose of preventing
Reverse Currents going
thru to Condenser.

2nd test is with Audion
lamp in ~~action~~^{action} merely as a
valve

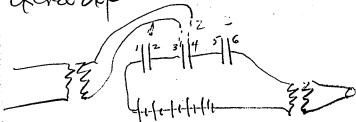
Neither tests work only
give 1" throw when
phonograph $\frac{1}{2}$ " away
probably Condenser
Too Small Capacity -



We try this to see what
it will do -

Dont work - put 2 choke
Coils 1500 ohms each in
series in cut X
This dont work

Extra Expt



4 mfd Condensers at 1 2 & 3

Connected to 3 & 4

Nothing

2 to 5 - Nothing

None any guess

Expts Column 73



X Coil not connected w/o zero -

2nd

Connect coil as per dotted
line - w/o zero

74

3

Connect Coil in the
usual way used

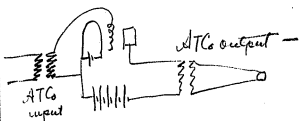
6 cells 1 cell N to $\frac{2}{3}$

then 2 3 4 + 20 until

10 + note zero

Hell

75

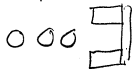


Reg way

We are going to try a strong
Electromagnet besides the
3 bulbs to see if the
Magnetic lines will
attract the Electron and
+ make it steady -

It makes a good zero
but amplifying power
reduced from 10 to
5 inches 5 5

76
We now put magnet



instead of 1st experiment



000-

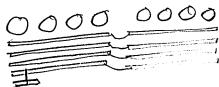
This not good Zero
but think it increasing
Multiplying power
2" phonoclix 2 1/2 @ 3"
Heres - unsteady
but good -

77

We now try a new Experiment
Instead of using 3
bulbs - in Multiple core
we use 6

While amplifying power
don't increase after 3rd
bulb is in, it is hoped
that putting in several
more than any particular
bulb if electron core in it
changes suddenly that
it will be a small
% of the whole

74
+ thus while the sudden
strong epits occur in all
lumps at times, they
will on account of
the number of lumps
be reduced in
strength & give a large
number of weaker ones
which will not batter
the mirrors so much



Its probably not
the bulbs But
it is static
affecting the bulbs -
(e) amplified doubts of
static -

The resistance of ⁷⁹ 7500 ohms
per lamp will be reduced
by 8 lamps to
937 ohms -

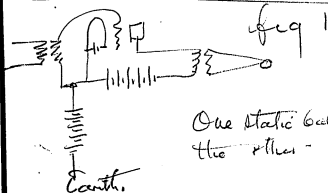
We find that the sudden
spits of Current comes even
with 6 bulbs in
Multiple - The zero is a
little better & with
2" phonograph wire put
was less than 2" because
was being to $3 @ 3\frac{1}{2}"$

80

Some of our past Experiments on
Zero has been Vilitated by
bad Contacts on our

Tuning Drum —

We are now cleaning the
wire, bands, & Contact
Springs —



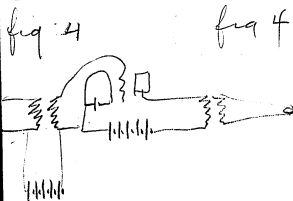
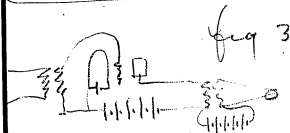
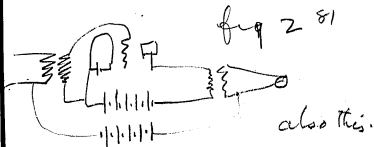
About the same bad waving
Reversed direction - just the same "

fig 2 one direction bipolar
 at open mirror switch -
 Unsteady mirror
 Reversed battery - just as bad

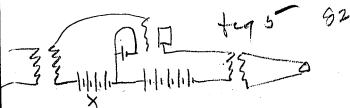
NO 4 = Unsteady - static when
 mirror switch closed
 Reversed battery - wavy
 just the same

NO 3 -

No good Either way



Always notice that singing
humming etc is always
due to some change
~~beyond~~ at Output Coil
of Audion
or input Coil of 2nd
Audion —



~~Battery one way dead zero
no singing when phenacetylene
running —
Reversed & dead zero —
Took off 1/2 of X battery
One way nothing~~

Jerry has put batteries
in wrong

Fig 5
WE try it over again —

Connected 1 way at X
all on nothing 1/2 on
nothing — Reverse
nothing — battery off —
ok

1 way 1 cell swing ok
 2 & so on till 20 when
 swing went from 2"
 to $\frac{1}{2}$ " Reversed battery
 2 cells back it to dead
 Zero — all the time
 of 4 points Phonoplex
 2" away & running
 The 2 cells that
 killed swing was
 putting thru second
 to grid —

Past Experiments

83

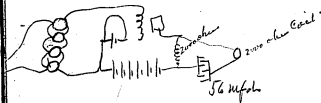
One Audion —

Page 3 book 3

Input-coils 4 Westn Elec
 1800 ohm closed coils —
 primaries in series, secondaries
 in series
 using Condensers for Output.

2000 ohms from battery to
 Bulb plate to carry the current

Phonoplex $2\frac{1}{2}$ " away
 $\frac{1}{2}$ " throw
 Phonoplex 3" away $\frac{1}{8}$ "
 throw at 1" goes off scale.



135 V Edison detector —

3 bulbs type L

Condensers for output
give better Zeros are much
higher efficiency & more
practical & cheaper -

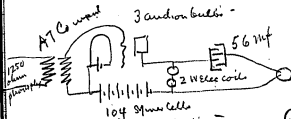
This at 3" phonoplex is 18 times
amplified from direct.

BEST + Most
practical yet,

84

We now drop the Experiment on
page 83 - but instead of using
Electric Coils for input we
use Arden T Co's input coil &

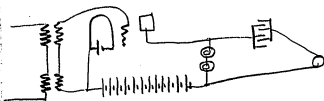
56 Mf Condensers for output
& instead of 2000 Ohm Res.
we use 2 W Elec closed induction
Coils 1800 Ohm each in series



This gives 2" Hvac when
phonoplex is $2\frac{1}{2}$ " away
The Zero is pretty good
OK for $2\frac{1}{2}$ " tried 3" away
of phonoplex & get 1"
which was very little disturbance
& seldom went to Zero, it was
unmistakable - 3 bulbs used

Page 84 $\frac{1}{2}$

We should try this -



Using 2 - ATCo Input coils both
primaries + secondaries in series
+ 208 Cells in series -

possibly more than 56 Mf of
Condensers -

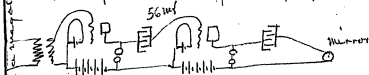
This doubles battery in bulb
+ doubles Vols on grid -

It may increase the amplification
without increasing bad Zeros

possibly 2 input coils should
be multiple instead series -
+ possibly only $\frac{1}{2}$ or 100 cells needed

84

We now once more try 2
Audions in series with Condensers
to duplicate the single 1 on page 84



ATCo Input Coil - 1250 ohm phonoph
3 bulbs in each series

Phonophlex 2 $\frac{1}{2}$ " away Nothing

Reversed the filament battery
on 2nd audion - Nothing -

Something wrong - probably
2nd Batch of Condensers -
just found 2nd batch short (ck)

2 audion
at 2 $\frac{1}{2}$ - gives 6" throw
at 3" gives 2 $\frac{1}{2}$ inches -

at 3 $\frac{1}{2}$ " phon gives 1" inch with
an occasional jump
Zeros almost as good as 1 audion only

Summarise —

1 Audion —

Phonoplex	Deflection
$2\frac{1}{2}$	2"
3"	1"

2 Audions —

Phonoplex	
$2\frac{1}{2}$	6"
3	$2\frac{1}{2}$
$3\frac{1}{2}$	1"

The gain is nowhere near what it should be

Audions do not amplify ~~as~~ in proportion to first Audion take the 3" away. there is only $2\frac{1}{2}$ times multiplication —

87

Whereas if first audition
amplified the original current
10 times, which it certainly
does the deflection at 3" to not 1"
would be
1 10 inches at least

See Diagram page 84 $\frac{1}{2}$

We will now try this -
as it is simpler we could remove
a single coil to take place of the
2 separate coils -

3" phonoplex $1\frac{1}{2}$ — X

We now double up the battery to
208 Cells instead of 104
as with X result, I don't
improve still $1\frac{1}{2}$ throw a more
uneasy - its not more battery

56

We want think 104 Cells is enough
We now double up the Condensers
Does no better still $1\frac{1}{2}$

We now multiple are the
Primary Coils of the two
Input coils, leaving
Secondaries in series
This is not so good
We put them back in
series —

for fear they are not in
right direction we reverse
direction — no first way
was OK now put back

89

Now we make another
Change - We remove
the 2 Westinghouse choke
Coils & substitute 3600
ohms of plain resistance
to see what it does -
No good must have
choke coils - Very
unsteady lens without
them & scarcely any
focus -

We now put the two coils
back with one extra
one all in series -
not so good as 2

90

We now put 2 in series -
across 4 then 2 more in
series - This makes 4 Choke
Coils - total resistance
1800 ohms thus permitting
three as much current from
the battery to reach the
plates of the 3 tubes -
as in first experiment with
only 2 -

This is better yet $1\frac{1}{2}$ or 3^{plenty}
better than -

We now remove $\frac{1}{2}$ of the
Condensers -

Its not so good only
1" + then zero over

91.

Will shift the act, & put in
the other act to acc of
differences in Condensers
~~no differences~~

Best to have all the
Condensers on

We now remove $\frac{1}{2}$
of the battery on grids
leaving 104 cells on

This is better gives $1\frac{1}{2}$ &
pretty steady —

added the Extra bunch
of Condensers but
its too much makes
it unsteady

92

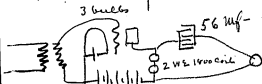
We now add 3 more
bulbs making 6 bulbs
in all —

Been using 4.550 Ohm
Mirror Coil
#3 AR

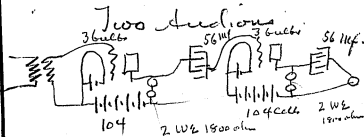
* finale —

93

Best single audition



ATC 104 cells 2" throw at 2 1/2 phono
Input 1" throw at 3" phono
fairly constant.



6" throw with 2 1/2 phono
2 1/2" throw with 3" phono
1" throw with 3 1/2" phono

Notes for a good Carbon telephone

Verum fec Phonoplex without deflection		
Strength of field at a distance of of $1\frac{1}{2}$ throw		
1 inch	100%	Amplifier times
$1\frac{1}{2}$ "	29.4	3.4
2 "	12.5	8
$2\frac{1}{2}$ "	6.4	15.6
3	3.7	27
$3\frac{1}{2}$	2.3	43.5
4	1.6	62.5
$4\frac{1}{2}$	1.1	91
5	0.8	125 times


at 1" ^{phonoplex} get $1\frac{1}{2}$ deflection
without anderson


Notebook Series -- Notebooks by Edison
Notebook, N-17-00-00.8

This undated notebook is a continuation of N-17-06-28. It was used by Edison, probably in July 1917, to record research on the measurement and amplification of sound for the U.S. Navy during World War I. Included are notes on the construction of mirror galvanometers and other measuring devices, numbered U18 and U24-U35, as well as an experiment with a "silver carbon telephone." Additional entries made on board ship near Sandy Hook, New Jersey, relate to Edison's tests of experimental amplifying equipment for direction finding and detecting sound under water. The notes indicate that Jerry T. Chesler and Absalom M. Kennedy assisted Edison in this work. The front cover is labeled "U.5." The pages are unnumbered. Approximately 20 pages have been used.

17-00-00


Re Made U mirrors —


U26  mirror, ^{only} fairly stable to shock


U18  Quite stable as it once was


U27  Quite stable


U24  fairly stable

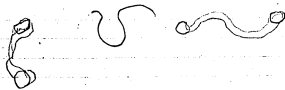
U25  Very stable

U28.  Extremely Stable

U29-  only fairly stable

U30  only fairly stable

U31-  somewhat unstable



U32  fairly stable

U33. Cant get in galv fix it

U34  pretty stable

U35  Wobbles bad.

Experiments with Silver Carbon Telephone

Limit hearing phonograph ^{in box} 20 ft with
 Bell as transmitted 30 ft Silver Carbon
 This Experiment is N.G. - Jerry hears it
 thru the air

He now uses Stethoscope tubes + goes into
 another building -
 get music clear + good in Carbon + only
 some notes in Bell -

We now stuff some cloth in funnel
 of phonograph - Can with Carbon
 hear music but very faint. - 16 ft. from
 Phonograph -

Bell - Can just make out tune at
 5 ft.

17-100-00

Onboard-off end hook

The boat rolls considerably when Engine running + boat rolling some phonograph 1 1/2 got with 1 and on 5 @ 6" throw keeps on scale fairly well -

Scale too narrow with regular Tuner - should be twice as wide.

There is some white Caps + many vessels laying inside on account of storm outside - been blowing for 2 days from North East with rain

Think the pivoted Tuner will be necessary for

this work -

We only have 7 well amp
on the 6 condion bulbs, the
batteries are evidently low

I notice as boat swings
around the zero change
don't understand this
as strong tuning magnet
ought to hold it

The tuned $1\frac{1}{2}$ " phonograph
arm is fairly steady
very little static
jump -

17-(00-00)

So far this is a good test for
installation, 2 days from boat camp
~~the~~ no attempt at insulation only
using the small rubber
covered wires. Big Veeq &
Andions are well insulated
but Condenser & battery
& everything else right on
boat boards -
tunes also -

Big Tug: ^{another both weight} 2500 yds get
 $\frac{1}{2}$ " thickness - on 270 Melampor
tunes. This is first place
found - the $\frac{1}{2}$ " is unequalled
may be 2. Cleanest
interference

17-100-002



Went to 600 on Tuner

Notice When 250 Mc amp
on Tuner Mirror spot
keeps Zero with 2"
although Coast rally
very minute

Now 240 Mc amp--
Boat



gives 1" throws here
1500 ftd nose Boat here
Tug

240 mld amp best 270 wipes
turning out. also
going to 200 wipes it
out —

boat being on wrong side
is getting weaker
try stopped at Highlands

got a slight turning at
100 mld amp

Now 67 mld amp spot keeps
with ~~it~~ 2" of zero & OK

~~OK~~

We ran down to 7 mil
any on turn given
opened it - The spot
light was OK &
practical - at 7 mil
spot steady but moved
over ~~ground~~ 3 or 4"
of scale as boat
moved this don't
bother at all -

Probable reason is
low Res of Water
phone (old ray bell)
go down whereas

phonograph Call is 1250 chin
although 2 steamers
in sight got nothing
at low Wilcamp
now going up in
Wilcamp

shows $\frac{1}{2}$ V. 6 at 38 Wilcamp
Big str coming into
Ambrose 5 miles away
42 Wilcamp better

also a tug 1000 yds in sight
right angles to Harri

Kennedy thinks the big
str 4 miles away is a Defender

22@23 was melamp
on phonoplex
6 Vib 9cc wheel
we started with
This Melamp
U25 —

ting now in front of horn
1500 yds - $\frac{1}{4}$ " many irregular
& uncertain - big sh
not in sight - Rain makes
a fog so cant see far -
Side vehicles in sight
4000 yds & 2 other
boats

at 245 Melamp get
 $\frac{1}{2}$ to 1" throw -

upto 600 Melamp -
Spot already at here
no matter how fast roll
or pitch - get nothing
from 245 up -

Boat made awful
large 20" everything
swashed about
but Zero kept OK
with old phone in
sea

Went to 1000 Wld amp
saw no signs -
We now take off battery
to go from 0 to 300
Wld amp -

Boat 250 yds away
Zero to 1" irregular

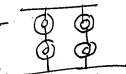
All these results
so far are Extremely
Doubleful -

With switch open
at Mirror we
get the throw irregular
of $\frac{1}{2}$ to 1" + it
not from the sea
Evidently -

245 Midway on field
seems a point where
Mirror is sensitive
to a swing when
switch open -

As we only got 7 Mid
way to bulbs we
multiple arc 2

More WE Induction
Coils -



got 42 Mil amp
in bulbs - now
very much more
accurate -

We rigged up switch
& could throw out
sea phone & put in
another phone -
with boat phone in
zero with sea
phone in

gfd from zero to $1 \frac{1}{2}$
etc - at times

2" for several seconds
str 1000 yards -

all uncertain as
min ago he said
3500 yds -

Either this is time
of rope or its eleam

No doubt something
comes from the
sea but its not
a steady throw
but fairly so
Zeroing now & then

Note that we get
tuning at 42 & 245
What is it - ^{Heater} Rope ^{or}
and on party, or Condenser and valve system
or ~~blowdown~~ - 42 is
about 7 @ 7½ -
Can't say what
245 is - probably
15 or around that,
a Multiple evidently -
But What is it
must find out

0 0 0 0 0 0

We now put in the Long
Ball of 2440 lbs just
wound by Milner

This is ~~very much~~
more sensitive at

245 - when it is
about near vibrated
nearly of scale

when 2500 yds
away vibrations
about 2200 to 22½"

We get jump on Merrow
when after winds
near big Cannon

at back go off -
jump from Dead End
to $1/2''$ = 620 west ang
was on timer —

**Notebook Series -- Notebooks by Edison
Notebook, N-17-07-11**

This notebook is probably a continuation of N-17-00-00.8. It was used by Edison and Jerry T. Chesler in July 1917 to record wartime research for the U. S. Navy on the amplification and detection of sound. Included are experiments with carbon buttons for telephones used in experimental amplifying devices and experiments with the telephone receivers used as transmitters, as well as tests for electrical resonance within related circuits. The notes indicate that Sherwood T. (Sam) Moore and Charles T. Dally assisted Edison in some cases. The front cover is labeled "No. 6." The pages are unnumbered. Approximately 25 pages have been used.

July 11th 1917

Experiments with Carbon
buttons for Carbon Telephone

Metallic discs coated over
with a very thin film of
conducting lamp black

1 or more buttons, under
sea receiver -

India Ink seems to be free
of specs of lamp black
its in a cement like

Distin when it
dries on glass

or porcelain it is not
rubbed off by fingers —
When thin it is light
brown —

Grinding Lampblack
with Gelatin is impossible
get clots out & it also
rubs off —

With Oxolin can get
most clots out & it
acts like India ink
but it tends to rub
off — if alk. or acid
it coagulates & the
Lampblack goes into

Clots as original = This
is very striking + shows
Care must be taken to
prevent Coagulation by
Electrolytes —

Spinning in little agate
Mortar + Glycerine +
Lump black brinks clot
up perfectly — no Electrolytes
Don't dry up Course

India ink - few drops poured into
water & very much diluted shows
brown, not clots, its drying on
glass & porcelain - Think this
will be good if Conducts OK

Our blank Varnish Clotted
& Resin - NQ as alcohol
Evaporates readily
this Clots it with
Resin - Rather -

Record face Var work OK
Clots disappear except dont
dries quick with very dilute
dont rub off - fear too much
lead in it,

Have made films across glass
to measure -

Only the Record Vacuum gives
a click in phone, when 2 cells
opened in primary - the phone
+ secondary in ckt -

Glycerine + Lampblack is best
or loudest but probably
dies to water in glycerine

Probably Res more than
Several Megohms -

If as a button, it would
probably be 1000 ohms
or more -

Moore buttons

$\frac{1}{2}$ lb pressure 41 @ 65/100
of ohms -

With weight of disc only
76 ohms, variable by part -
2 lampblack surfaces
together,

We now with scales starting
with 10 grams weight
gradually diminish weight
to get a Curve

$$\begin{array}{r}
 620000 \\
 \times 100000 \\
 \hline
 620000000000 \\
 1240000000000 \\
 \hline
 620000000000000
 \end{array}$$

A Moore button covered
 poorly with Lampblack
 and Scheate Soda gives
 with $\frac{1}{2}$ lb pressurizer

62000 ohms - against
 10 megohms 1" across
 glass or 155 times
 less on button,

Tied Moore button with
 Milamp meter -

Very irregular - can go up to
 50 milamp + down to 2 milamp
 by pressing -

5 grams generally makes
diff of 2 mil amp.

Three in series not as good
as a single button -

Apparently air film interferes
as noticed one button stick
to the other. Moore got
them very flat + also
lamp black put on by
scrubbing down to
strong hydraulic pressure.

We are trying to remove
the air defect by scraping
lamp off so remainder

is in squares $\frac{1}{32}$ to $\frac{1}{16}$



The white
representing the lamp black
spot, This showed
removal the air from
there —

This is more sensitive so 500
mg shows 2 mil amp change
1 from several milgrains

but it was against a complete
carbon surface not charcoal

Edison Can hear the wheel
round to $\frac{1}{10}$ th of a Milamp
passing than a penny

1 Cell storage battery (Miner)
primary 260 ohms
secondary 2800-

Put Cell in without coil -
1200 ohms brought it to
1 Milamp - I could hear it
easy with 11000 ohms in
can hear probably $\frac{1}{12}$ to
 $\frac{1}{15}$ of a Milampere -

We trimmed wick of Kerosene
Lamp & burned




Some Lampblack the old way
once used in early days for
transmitting buttons — The
black was intensely black
and a very fine conductor
several times better than that
burned by Dally

This kerosene Lampblack
is very sensitive to pressure
it cakes together on pressure
I think we can make
small button $\frac{1}{8} \times .032$ thick
that can be handled

One thing is certain we
must get the pressure disc
operated by phone lever
so it bears even on the
lamp block otherwise it
tends just as likely weaken
circuit when pressure
applied as to strengthen
it -

Monday July 16 - 1917

Tests to determine sensitiveness
of long bell receiver used as
transmitter. 

Apparatus used Amberola 30 -
with blue Amberola record
playing "Smiles, Then Kisses"
Natty. Phonograph is set in
a ~~to~~ box padded with cow
hair and has only one opening
in front $\frac{1}{16}$ " in diam. The box
containing phonograph is set
up to about the same level

as transmitter under test
and directly in line with
same. The line from transmitter
is run to Chemical storehouse
building where the sound
is received on another Bell
receiver.

In all tests the phonograph
is moved further and further
away from transmitter until
the music can no longer be
heard on receiver in the next
building.

~~Test with transmitter #1~~

Mark can be found under
diaphragm scratched in brass
bell. This was done so that
if ~~transmitter~~ transmitter is removed
from rubber shell it can still
be identified.

Transmitter #1, Test.

Test conducted under general
noisy condition prevailing around

4 P.M.

~~At #~~ With phonograph 6' ft
away from transmitter could
just about make out tones

Phonograph 7ft away could not
get entire time the predominating
notes only being plainly heard.

Phonograph 11ft away practically
entirely gone. Could hear the
phonograph at all.

Test with ^{Self} Transmitter #2 Under
same conditions as Transmitter
no. 1. about 4:30 PM.

With phonograph 6ft away
from transmitter could just
about make out time.

Phonograph 7ft away could

not get entire time same
as in test on first transmitter
Phonograph 11 ft away
could not hear time
at all — nothing.

Test with ^{Bell} Transmitter #3
under same conditions as last
two. 5 P.M.

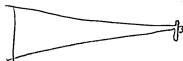
with Phonograph 5 ft away
from transmitter could just
about make out time.

Phonograph 6 ft away could

not get entire tune the
predominating notes only being
plainly heard.

Phonograph 10 ft away. Can't
hear the phonograph at
all

July 19

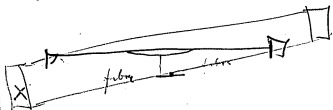


We now have gold beater skin
with Cilia & pin making
a mirror, all in Contradictable
magnets field -

Skin too tight not sensitive
but at 760 Ma get
spasmodic - vibrations of
light twice as some times
3 times its diameter
Can't say where this
sound comes from

The point to move mirror
is N.G. too much friction

We connected Diaphragm
to mirror by a single
fibre of silk, this
made it OK



Then we swivelled the field
magnet a little to put
tension of the mirror &
diaphragm fibres -

The tuning is high 15 to 30
Can't say yet, it moves
5 to 6" - but unstable as
air is unstable -

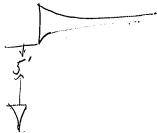
The sound coming from
siren & use of very light
fuel 2 1/2 ft away
laying on table



Siren & fuel

We now move over

funnel 5 ft away
from Mouth of funnel
of Mirrors =



with air wave disc
running at 8 impulses
per second tuning on
galvanometer is at
250, -500, and 960
mils amp

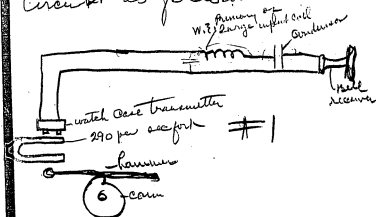
405- Wa tuning.
Microphone - 6 coils
Multiple in primary
6 Coils series in
Secondary - Big
Output Coil +
Microphone 3 @ 4 ft
away zero to 12"
throw throw -

38 Rev on Screen
(12 holes) 3/4 lb
press - funnel

Tuesday July 24/17

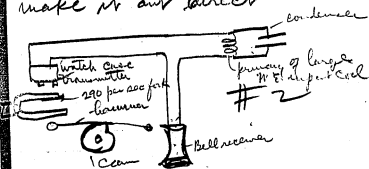
Tests for Electrical Resonance

Circuit as follows.



Adjusted fork $3\frac{1}{2}$ " rich from
magnetic phone. direct could just
barely hear fork in Bell receiver
inserted inductance using second
any of large W. E. Duput. cond

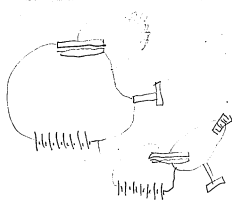
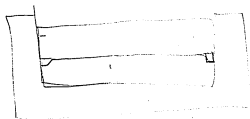
in series with Condensers but
 could hear nothing. Cut out
 secondary and introduced primary
 of same coil in circuit and
 tuned condensers to .74 micro
 farad, could hear fork plainly
~~at~~ where could just barely
 make it out direct



Notebook Series -- Notebooks by Edison
Notebook, N-17-07-25

This undated notebook was possibly used during July 1917. All of the entries are by Edison. Some pertain to his work for the U.S. Navy during World War I, while others relate to ongoing efforts to improve the surface quality of Edison disc records. Included are lists of possible smoke and fog generating methods for use by merchant ships at sea, along with drawings of possible submarine or torpedo detection devices. Additional entries directed to William W. Dinwiddie propose experiments on the construction of powder blanks for disc records. Inserted into the book are three loose reports by J. Miller, giving the results of tests with experimental disc records. The reports probably relate to experiments described in N-17-07-15 and other Disc Record Books (Notebooks by Edison and Other Experimenters). The pages are unnumbered. Only 15 pages have been used.

73498
Ames Co.,
IRON SHEDDERS,
10 JOHN ST.
AND
10 PLATT ST.



Zinc dust mixed with something
that will itself burn &
Carry off the white Zinc
as smoke -

See prices of Metallic
Calcium - ditto Sodium
to make smoke -

See prices of solid SO_2
for smoke -

Put up with steam ditto
compressed air & force Rinslings
& other powders through into air
to make a smoke

Smothered burning of saw dust
- wood etc

Burn Resin - Wood lag, wood, etc

Distill Sulphur Vapor come
off & Condenses to Amorphous

Stomping Ferrous Chloride HS.
also other salts. to get black
Smoke

HS. burned with air (controlled)
O combines with the H giving
finely divided Sulphur

Heat Sulphuric acid till it
decomposes gives fumes

Solid SO₂ kept for some time
opaque solid & heating don't
melt but volatilizes

Vapor of SO_2 forms dense white
fumes - which are really
droplets of H_2SO_4

40% of SO_2 acid is solid at
ordinary temp + only liquid
by gently warming

White phosph heated ^{by}
with a Caustic Soda
solution gives off
spontaneously inflamm phosph.

Silicon hydride -

SiH_4 - ignites spontaneously
gives smoke of SiO_2

Phosphorus trichloride
fumes in air

Sulfur Chloride fumes

Phosphorus pentachloride fumes
very strongly

Phosphorus oxychloride fumes strongly

Silicon Chloride fumes strongly

Stoneman's Mix of FeCl_2 & FeCl_3
to form black smoke & at same
time a spray of soda solution



0

2000

Stomize Oil with steam
if get right kind of oil of
very little Vapor tension so it
will not evaporate it will
coat the water felds & prevent
water from evaporating & thus
make a permanent fog

Perhaps a solid like Naphthalen
Resin dissolved in the oil or
no oil & then substances melted
passing superheated steam
through the liquid solid being
higher temp than the steam
will carry it along - or
the solid giving off vapor
these will mix with steam

4 percent, Coal tar,
Naphthalene, Rosin, Sulphur
+ higher discharges than H.P. of
Sulphur, (Sulphur charcoal)
if it will work - always Soap solution
from soap + HCl, or U.S.G. - Tipler,

Get address Hftr. & Tompkins
oil burner always a little
information,

Put chemical directly on a
bomb timer for smoke
bombs for Merchant ships
to the propellant & codes

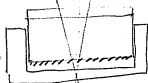
Dumweldie -

$\frac{1}{3}$ rd Load - Nail scraper

another $\frac{1}{3}$

third $\frac{1}{3}$

Each scrape has shorter nails -



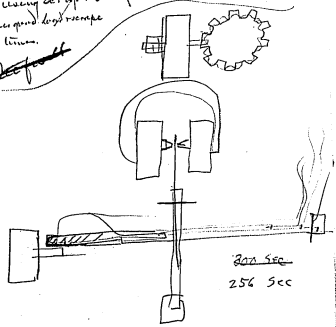
Screen - rotated & filled with weighed amount of ash & reciprocated up and down while rotated & at same time is gradually withdrawn so its even the off level is down before rotating

variable raised up & down & gradual withdrawal

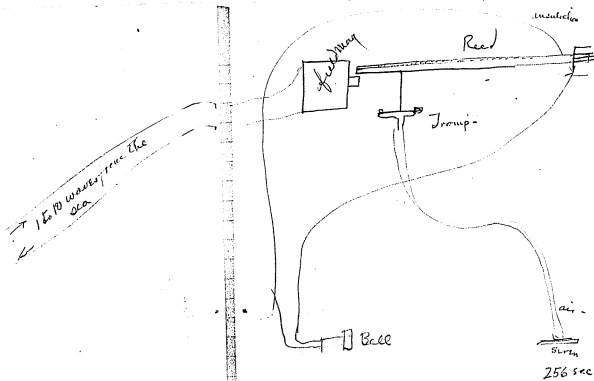
See Dumweldie about several types of loaders. Not 1 along best device I know of & get their apple - Once you had heard Edgley this acted as a ring to place and catching you must get it again - Load $\frac{1}{2}$ - scrape then load other $\frac{1}{2}$ - scrape - Can load from Bags using scrap & I can load no hopper

if this good long scrape 3 times.

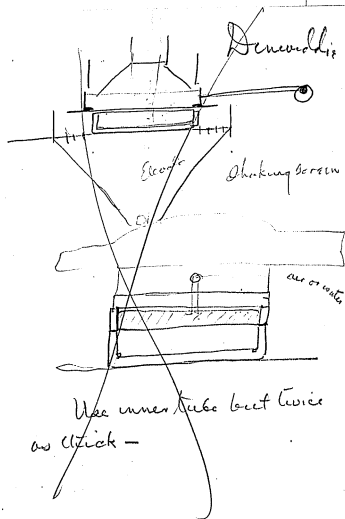
~~Scrap~~



300 Sec
256 Sec



Reed vibrates a loop between the poles
of the field magnet. Then can hear the
waves,



If by nature then, they would
Exhaust battery of a $3/4$ "
shot put in here

Fill $1/2$ Rubber press them
 $1/2$ again & rubber press

Take powder Mix $3/4$
Straw oil — ditto
 $5/8$ — use —

foq—

Perhaps changed production
Should be changed electrically
or use vera atomizer grounded
& give potential of the earth

Try the White Phosphorus
with Soda heated & see
just what they do now

Find out if water pumps
overlooked are worked
by Motor or how & if by
Motor could they work them
by gas or connection with Diesel Eng

Dunroddie

Mix powder in mixer

with 1% H₂O -

2% -

3% -

5% -

to destroy elasticity of fibres
while being matted

Put a Middle plate
polished & make 2
thin blanks each time
use 2 to print,

[ITEMS(S) FOUND IN BOOK]

Monday July 28 1914.

Faces tested 80.

Rejected by x 7

Rejected by Miller 7

Drop test Average 78

Average Caliper points 326.1

Lowest Caliper points 311

Send to Baldwin 7,076

Remarks
General Surface Good.

Miller

[ITEMS(S) FOUND IN BOOK]

~~Tuesday~~ July 24, '10

Grass tested 80
Rejected by 8 & 9
Rejected by Muller 7

Drop test Average 45
Average Galipso Points 210
Sorted Galipso Points 199.3
Sent to Baldwin 5,155

Remark
General Surface Good

J. Muller

[ITEMS(S) FOUND IN BOOK]

Wednesday. July 25/91

Faces tested 80

Rejected by x 6

Rejected by Miller 6

Drop test Average 81

Average Outlines Points 214.9

Lowest Outlines Points 203.1

Send to Balducci 7/12

Remarks
General Surfaces Good

J. Miller

Notebook Series -- Notebooks by Edison
Notebook, N-22-00-00.1

The notebook contains dated entries from July-September 1917. It has been used in both directions. At one end is a series of undated speculations by Edison in regard to ether, light and optics, astronomy, electricity, electromagnetism, gravitation energy, and other topics. Among the numerous theorists he mentions are Augustin Louis Cauchy, James Challis, Rudolf Clausius, Albert Einstein, John Herschel, Lord Kelvin, Pierre Simon Laplace, and Georges Louis Le Sage. Several pages preceding the Edison entries have been removed from the book. At the other end of the book are notes by two unidentified experimenters pertaining to Edison's work for the U.S. Navy during World War I. These entries relate to "Splash Parallax" experiments at Red Bank, New Jersey, and include range and distance measurements for sighting of objects on Sandy Hook as viewed from the Atlantic Highlands and objects at Columbia University as viewed from the Palisades. The front cover is marked "Aether." The pages are unnumbered. Approximately 90 pages have been used.

7341

Edwards Co.,

MEG. STATIONERS,
51 JOHN ST.
AND
15 PLATT ST.
NEW YORK.

Benjamin Liebowitz.

to get dispersion Cauchy say the matter
in a prism must be ^{continuous} granular because there
could be no pneumatic colors if light was a
wave motion + the glass of the prism was
Continuum or granular structure with infinitely
small grains Says it must be distinctly
granular whether it be discontinuum or not
+ its granulations not greatly less than in
diameter than 10,000 of the wave length of the
shortest wave of light or about

500,000,000 of an inch - Kelvin says
200 to 600 Molecules in one wave length

Limit of slope $\frac{1}{200,000,000}$ of
a Molecule attained experimentally

Kelvin says if a drop of water was
magnified to size of the Earth
the Molecules would ^{each} occupy space
greater than those filled by small
shot + less than that filled by
Cricket balls - Such a lot
of atoms gives me courage
to proceed in this granulation
Energy + Gravitation work

At 42° ^{600 pascals} falling mean free path of Hydrogen
 which has the longest trajectory seems to be
 20,000 mm — or a tenth part of length of
 a light wave ^{10,000 mμ (Crooks)}
 Dia of a Molecule is not the same
 for all Elements but average is
 about $\frac{8}{10,000,000}$ mm

Smallest Visible Organic particle is $\frac{1}{1000}$ mm Dia
 & will contain 30,000,000 atoms arranged
 in about 40,000 Molecules

Number of Molecules in Cubic CM.
 at ord Temp & pressure is 19,180,000,000
 Maxwell — 1 = 210,000 (Crooks) not more than
 6-21 couple Kelvin —

Danish p 225 says Earth is passing
 thru at present Volume of (Benzol.)
 Ethyl hydride rather alcoholic
 derivations — Over almost at such
 limits is losing N & O. slowly
 & possibly gaining what we lost
 by free path movement

No attraction between molecules (Boyle's law)
but by compression a point is reached
at high pressure when it does follow
the law when near condensation to a
liquid all do this except H_2 .
They are more easily compressed at this
point

Dalton's law is departed from
by a mix of gases condensable with
difficulty such a mix is found
to be even less condensable than
the component gases & the critical
temp is lowered

Charles law not obeyed

throughout the whole range of
experimental pressures & temp
at a high pressure any increment
of heat produces a disproportionately
large increment of pressure

Order of ductility Au Ag Pt Fe Cu Pd Al Zn
Sn Pb

In gas the pressure diminishes about
 $\frac{1}{273}$ for each Centigrade degree of cooling
the temp of 0° Cent being the starting
point & Volume being maintained constant
If cooled down to 273° C. it wouldn't
have any kinetic Energy & no heat.

Spec heat of H is 16 times the
Spec heat of O, to bring both to
same temp.

Spec ht div by Atomic wt 6.4 all
but phos & S is 5.86 to 6.93
of Carbon Silicon & Boron 3.3
but at higher temps it rises to
5.5 -

A substance not allowed to expand &
is heated no internal or external work
is done & all the heat goes to raise
its temp -

Sun is 600 times more massive than
all the planets —

See Bode's Law

Major planets all move around the
sun in the same direction W to East

Orbits are but little inclined to each
other

All minor planets have same
Common direction but orbits
have greater eccentricity &
mutual inclination.

General rule is they move around
in same direction of rotation
inclination. Exception occurs
with satellites of Uranus,
which are nearly perpendicular
to plane of orbit —

Satellite of Neptune & one
satellite of Saturn, are exceptions
direction of Motion being
Retrograde.

the greater the distance of a planet from
the sun the less is the speed with which
it moves in its orbit.
Orbit being larger, the time of its
Revolution is greater in a yet larger degree

Linear speed approximately is
inversely proportional to square
root of the mean distance

Kepler Law - Squares of the times of
Revolution are proportional to the
Cubes of the mean distances

"Under planet" in Ency Brit is
a table of characteristics of planets

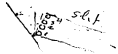
UP are perfectly spherical + perfectly
elastic, there is only 1 rate of vibration for
all single UP, aggregates are many each having a
material rate

A low energy impacts all give one
light, if impacts are harder the rate
don't change but amplitude increases
Even the light which can just be seen
has the full spectrum, but only a little

is visible as the WP receives a harder & low
amplitude increase & we see more of
the spectrum but the part 1st visible
increases in brightness as well & so on
until we reach beyond the ultra violet
but nothing has changed except
the brightness due to increased amplitude.

The reason Red or yellow appears
first is a secondary & local
phenomena due to the eye

The separation into colors is due
to the WP impacts acting on
matter mechanically shaped
to cause vibrations to be set up
in one side of a WP aggregate
before another impact reaches
the other part



Light as light does not go into the
brain, it only causes an excitement
because we can see pictures brightly
illuminated ~~so~~ long after the light
has ceased

The effect of light excites a phosphorus within the brain on some substance appearing at the seat of sensation within the brain as a moving picture.

All interplanetary ^{and the} space has all energy ~~and~~ converted by UP particles moving at an average Vel of say 186 000 miles/sec

These striking matter like the Earth are conveyed thru the Earth not by motion of the UP particles but by vibration + exchange from UP groups to adjacent groups until on the opposite side of the Earth the vibration is communicated to a free single UP + it proceeds into space at a lower speed but in time by collisions is brought up to the average speed of 186 000 M per second some UP may be 200 000 miles per second + some $\frac{1}{2}$ or less in space a still slower in the interiors of groups.

The UP groups of various sizes are free + the space between each group is filled with rapid moving single UP particles which can convey the vibration from group to group by bodily movement as in space.

Evidently the speed of vibration must be when it reaches to opposite side of the earth very much slower + heat is ~~be~~ absorbed to the extent of the loss of speed.

Passing thru the moon the loss is small + the moon must be rather cool internally.

With the earth more heat is absorbed,

But with the sun the loss must be great + account for the sun's high temp. it being constantly supplied from the UP from space.

Note of 2 platinum balls 1 soft, 1 much dia + 1 of 2
inch dia put into a furnace (the small one would remain
Red 10° after both were red (1000° F))
The large ball would still be red after the 1"
was dark.

The energy of impact given to the
Water of the sun & converted into
Vibration + the subsequent throwing
out of a WP into space necessarily
from the great thickness of the
sun that it would have a very
low Comparative Velocity
towards the earth while the
particles from the earth much
higher the particles striking
the earth on opposite side
or dark part have full
speed - Hence the tendency
of the earth to move in a
straight line by centrifugal
action is exactly balanced
by pushing it towards
the sun especially as
the particles from the sun
are very ^{much} slower.

The screening action of
the planets as compared to
the sun is small - hence only
the whole effect is not large
but together with the Moon

will account for the tides
+ also account for gravitation


If the Earth was isolated in
space + perfectly spherical
and homogeneous + rigid + gaseous
then a Cubic Crystal 1 inch square
would already weigh the same

+
If now the sun appeared

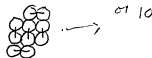
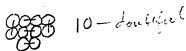
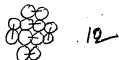
Immediately screening would
appear and the bombardment
would continue till the
Earth would be forced to
go into a circle around
the sun - Now the Cubic
inch would weigh more
at 12 midnight than at
12 noon - because the
UP coming from space are faster
than from the space ^{between} ~~between~~
by the sun + the earth

A single UP going toward the sun ~~compacting~~ ^{retaining} on a Iron group of UPs has the amplitude of the UP Vib raised & on it revolving the Earth & Colliding with sun & proton increases the variability of a definite position in the Spectrum ~~indicated~~ Not 1 but thousands of UP having impressed within the $\frac{1}{2}$ amplitude. The many $\frac{1}{2}$ lines is due to the increasing number of UPs received increasing amplitude & till more lines are visible. It should be recalled that in the coarsest Spectrum all the lines are ~~there~~ ^{there}.

It looks as if the first compound UP formed was 2 & then increases by 2 which grow in Complexity.

 These 4 have 2 points of attraction & cannot hold a 5th as it will only have 1 point of attraction. If all these by grazing have rotations right will hold together against average speed of UP bombardment

The next would be ∞ 2



∞ This the first UP Complex may be the "electron" but I think it is more like 12. Hydrogen being my Complex

The velocity of matter in Vacuum by great
Condensation of pores from a small
surface could drive a UP Complex at
great Vel, but even if too of Vel of
light the energy might be conveyed by
transfer of the Vibration in the Complex
to single free UP + then travel at
Vel of light. - Being a single
particle of Acceptable in a flame up
to measure and it sends out waves
travelling with Vel of light.

Note. If all elements are made
of UP spheres cubes & other
shapes - it may be that
their different properties
are due to their or the Vibrating
times of each Complex when
struck or rather bombarded
by the UP single -

The Vibrating time of the Lead
Complex owing to Mass could
not be the same as Oxygen
hence Carbon would be lower the
rate of Vibration & gives out heat energy

to decompose P_0 , energy would
have to be received to decompose it
to shear free the groups, or make
a new combination

Perhaps the vibration instead
of increase or diminution
of rate might be in
amplitude or area
subjected to UP bombardment.

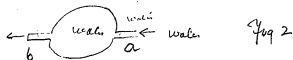
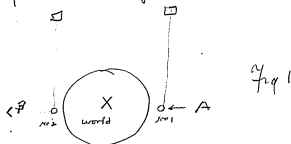
A single UP may have a
general Vel of 186000 sec
The 1st UP Complex would
go slower because it was
formed from those UP
which in the general mass
of universe made up of
single UPs. This is

□ 2 UP. When this was
caught by a planet & clapped
to vibration ^{or speed} would be $\frac{1}{2}$ or $\frac{1}{4}$
that of a single UP
tangled up in matter +
slow

If bullet has high speed it goes thru $\frac{1}{4}$ " steel & makes no light or smoke. If speed is lower it fails to pierce, gives light & lead goes off in smoke with Spectroscopy of Cracks if Vel great it penetrates the volume of lead shows it is stopped & gives light & rebounds

X ray retarded in proportion of Atomic weight, as its a high rate Light Vibration its only Ultra light
Hence the heavy Atomic wt has more UPs or larger complex as to thickness, hence in arranging UPs to represent the number of UPs & their disposition as to group, the above should be kept in mind as to shape the X-ray has to penetrate. Evidently should not be sheets. But if they are leaves then with the metal say they are in all positions & penetration would average up no matter what shape or size

Work this out - Think should be worked out on basis of Extra Crystals which may be violation of seedlines -



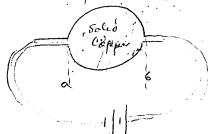
If fig one X is billiard ball + perfectly elastic + $X01 + 2$ very minute balls perfectly elastic. If $X01$ hit at 4000 ft/sec $X02$ would fly off 4000 ft/sec. The intervention of X would amount to nothing except distance of travel.

So UP of space Count how far the world is made up of UP Complexes without loss of spatial space, just perfect.

Also the Vel would fall & the Ball
 that struck at 4000 ft/sec 1001 —
 would as represented by No 2 would
 Rebound as a slower speed, say
 3875 ft/sec

Fig 2 shows hollow Ball
 with water inside the Velocity
 of water entering a + emerging
 at b is very little different
 yet the Vel of water in hollow
 globe is very slow -

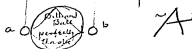
Fig 3



Electric circuit if a wire connected
 from a to b. The current would have
 a certain total Resistance, if now the
 wire between a & b were cut out & a
 large ball of Copper inserted the section
 a b would have enormously less
 Resistance but speed of the Electron

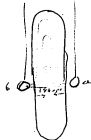
Stress would be the same

Very small Billiard balls



If a strikes at 186,000 Miles second, & ball is 186,000 Miles dia, the speed will be the same only a very little of the wave will reach a in 186,000 or 1 sec gradually increasing to full & tapering off like propagation of any electric waves. If dia of globe is doubled - then the time will be 2 seconds & speed be the same & lag the same but of the matter is in a form like

B



The speed will still be the same & same & same. Part of the wave will arrive at 'b' in the 1st part of the second but it will be very weak & the tail will not leave for say 3 seconds.

Thus in perfectly Elastic bodies -
a stress of any kind acts like
Electricity -



If we have a solid glass ball
placed a beam of light thru it from
a to b, it is said that the beam
is reduced to half the speed of light
- I do not believe this, I do not
think that any experiment warrants
this that is absolutely above suspicion
(whatever experiments warrant it is based
on theories that are not yet proved
altho they apparently are OK -

I think that the U.P. from say
the sun have impressed on them
various waves ~~by~~ received from other
U.P. & the impressed waves ~~continue~~
~~are~~ in the mass of the U.P. while
moving from sun to earth many
by collisions impart them to others
but the great majority get them from

sun to earth without Collision
+ impart these waves to the UP
Complex, as their energy & amplitude
are small the soon fall below measurement
when passing thru 30 to 50 ft of
glass. But the great waves due
to the Natural period of the UP
thick ~~200~~ ¹⁰⁰ Millions of times
greater proceed thru the whole
Earth without great loss.
The light waves are impressed exceedingly
weak & extremely complicated. Whereas
the UP of space all have a natural
period as well as the UP complex
of matter.

That these impressed waves are
complicated is shown by the great
number of them impressed on the UP.
to give 3000 lines in the spectroscopic



If a UP having on it certain impressed waves, not the Quantum Wave of its natural period, these waves will not spread out because a wave or ship is so small that when it starts to spread it almost immediately stopped laterally & the whole train arrives in a straight line at the opposite face of the glass there is very little broadening of the line. The D line shows this.

The great natural period waves on the UP spread ^{very} considerable.

This wave gives us heat.

The impact of a UP, increase ^{is slower with} the amplitude enormously & ~~base~~ ^{base}

there everything is not confined to an aperture of the slit.

It is only the fine impressed over low waves that are controlled by the slit & so analyzed so we can see the phenomenon of

the spectrum.

It is the impact wave that produces gravitation pressure. The enormous rapid overtone waves impressed on the UP

that gives the light pressure waves
& it is this unbalancing of the
Equal pressure on the Earth by
screaming of the Sun to cause
the Earth to be pushed towards
the Sun ~~not attracted~~ & to the
centrifugal ~~element~~ that counteracts
this pushing towards the sun
to the equilibrium point of 92 million
miles at present Vel of the Earth
in its orbit.

My point is that a mass of
perfectly Elastic Matter would
have a natural period which
period or rate would be constant
that carrying these waves in
absolute Matter free space they
would continue to ever
that if this matter was going
at a certain Vel should impact
so as to change its direction
it could transfer these vibrations
suppose the rate was a million
a second with 1 amplitude its
natural rate, it could have other

Wave impressed on it 100 million
a second & transfer these waves
to another particle

The question now arises is
this Could a single sphere
of matter perfectly Elastic have
any period of its own - I think it
Could if the Wave was $\frac{1}{2}$ its dia
or something thing like this ~~which~~
like a resonator Any other rates
that multiples of it would be
impressed as there would be no loss
from friction in the Matter of the
sphere & as the latter was
suspended in space free
from all Matter Action at a
distance impossible hence no
radiation all these vibrations
of the sphere would keep up
unimpaired in amplitude
forever

It is even possible that the
speed of these waves might be
~~the~~ than the speed of

Matter might be even greater
than the space of the sphere itself
than absolute space,
~~but it is that~~ light travels 186,000
miles in a second & is carried by the
~~the~~ US sphere moving at that
rate, but suppose a wire
186,000 miles long made of the
same perfectly elastic matter is used
What would be the speed of a
wave, as a guess I should
say very much faster, inertia
does not enter.

We must take into consideration
in the corpuscular theory that only
of the particle moving but
oscillations of its mass thru waves
too & fro

We observe a certain phenomenon by the
eye. We call it light, also by another instrument we
observe a phenomenon & we call it
radiant heat by another instrument
we call it electricity, by another
instrument we call it gravitation
but it all travels at the same rate
or velocity, & all are the same

thing, but in this transfer of
Energy it encounters Matter of
Various kinds hence we get
Various phenomenon, & we
measure these phenomenon with
Various instruments so as to
sensitive to convey the phenomenon
to our senses -

In all cases the instruments
used are Accumulative. The
Eye must be impressed for a
certain time before the phenomenon
of light is observed, if the
light, like an invisible star is
~~too~~ too weak we accumulate
it indirectly on a photographic
plate, the eye requires a second to accumulate
If heat we accumulate by
a barometer or thermometer
both accumulative - if
Electricity we accumulate
by storing in iron or
masses of matter both
accumulative -

Hence we are all observing
the effects or interaction of
Energy on Matter, leave out the Energy
and we don't investigate this -

All the energy is the universe
~~this is~~ originally came
from the primal & ultimate sphericals
of matter moving at a Vel
higher than 200,000 Miles a
second & all matter in masses
is the gradual formation of
Complexes of these primal
sphericals to form matter of
less speed & the increase of the
Complexes to form masses &
these into larger Masses & so
on till we have stars & planets
& that complexes are constantly
being formed ~~that~~ at this
moment. At this Complexes ~~at~~
all kinds of matter as well -
& they are ~~all~~ moving in
space aggregating with iron
Zinc & other Complexes to form
Matter so called.

That the energy stored up in
these ultimate sphericals moving
at these high speed through a
space unlimited in extent
is amply sufficient to supply
our sun & all other suns
with the energy now reckoned
to space ~~gas~~ but without
impairment for countless
centuries & without perceptibly
lowering the speed of these
sphericals 1 ft in a century if at
all

All the power we get for running
our locomotives, ships, etc
is got from the energy stored up
in the U.P. of space. We simply
accumulate it by slow & roundabout
methods & then let it return to
its original state more rapidly
than it was accumulated

All our elements are due to formation of aggregates of UO_2 . They form Complex's

These complex are not spherical they are square but different shapes. When 12 to 14 are formed from the simplest Complex ($2 UO_2$) they aggregate by 2's. ~~Each one diffuses~~ They start a new group still more Complex but the 1st one of the second group has a shape like the first one of the group known to us Hydrogen & so on for another group Repeating shapes every group.

When complex's of the same kind come together they form Crystals, & these are never spherical,

As to Electricity if we
rub a mass of Primal Complexes
They are not set in vibration
But if we rub Molecular
Compounds made up of 2 or
More Primal Complexes -
Then the Molecular Complex
are thrown into vibration
In other words they stir up
The Energy due to rubbing
The body is charged by
rubbing long & hard the
amplitude of these vibrations
not being transferable to other
matter increase if any
kind of matter comes in contact
The first amplitude is diminished
The new matter receives vibration
of lower amplitude if the
2nd body has infinitely large
mass it reduces the vibration
to practical zero & the
small body loses its vibration
entirely - If only the
2 bodies are close & both vibrating
at same amplitude they the 1st

body has no more effect
on 2nd body as they both
have same Rate of Vibration
+ same amplitude -

We call this phenomenon
Electricity, but it is only
the same vibration impressed on
larger masses & when allowed
to proceed + impart the
vibrations to ether matter it
travels at speed of light;

Energy concentrated in matter
in form of Vibration has a limit
when it can free itself ~~itself~~
and by imparting the Vibration
to adjacent Matter it will do so
explosively + proceed to lose
all its energy or Vibration.
If Conditions are such that
there is a lag as in a Leyden
Jar so after discharging it
can recharge itself then it
will oscillate + produce
alternating waves

Alloys, Compounds are chargeable or
Can be set in Vibration No Element
Can — phosphorous Sulphur
Selenium in one form conduct
The other forms a compound —
due to Combination with probably
the simplest Complex of UO
but so small as to be unweighable
when decomposed — $2 \text{ Se } + 4 \text{ P}$
cannot probably be set in
Vibration by rubbing —

With a Leyden jar, if balls
give a spark, it sends a
~~the~~ wave of train of Vibs
to the air of space in
one direction. At same
time with a lag it strains
the glass of the jar in an
opposite direction of its
first charge. This permits
the charge in the air to
Reverse its direction by
discharging back — note

The second wave starts in
while it passes around
the ~~same~~ circuit in reverse
direction it nevertheless
charges the air in the
same direction as 1st charge

So that the spark is bound
to be reversal of direction
several times yet the wave
going to spark is always
in the same direction

The apparent reversals
waves never given out by
the jar but are due to
discharges back to the
jar on reversal of direction
of the jar circuit

These waves I do not believe
go into the Ether of space
So called neither do they
go into & travel on the
Earth. Non Conducting
Matter like the glass is
necessary for propagating
the wave it goes in ~~the~~ HUP complex

Its speed is probably 186,000
miles/sec minus loss of
speed by conducting closed
circuits, = on account of
the comparative slow oscillation
in the jar or closed circuit on
discharging - The 1st discharge
wave can go out several
thousand miles & reverse its
direction & discharge at the
jar while its being recharged
for the reason that the speed
of propagation is so great.

A Leyden jar is an automatic
Reversing switch.

A charged mass goes in one
direction while charging
& when dischd goes in the
opposite direction. But there
is no P or N Elec

No more than a clock
wound up is P & run down
is negative.

Induction between 2 loops
 one of which has a battery
 acts the same way to the
 matter between coils. The wires are
 dischargers & chargers - or poles -
 in Vac to the UP possibly - or
 residual gas for UP Complex
 finer than H or α called Electrons

Storage battery will give a
 AC on a line



account for Expansion & Contraction
 of Metals, Crystalline or otherwise.

↓ UP Complex pressed together
 by UP bombardment, not in contact
 but UP particles having no speed
 at absolute zero but oscillate between
 + separate the Complex more & more
 as temp rises by increasing the Vel of the simple UP.

Laplace when he found that the
 force of gravitation if propagated
 by an elastic medium must
 have a velocity exceeding 100
 Million times that of light
 Concluded that whatever
 might continue to continue its
 action as instantaneous
 Hence the Res of the Ether is nil

of Janner says temp of
space is $50 \text{ @ } 60 \text{ C}$ below
Zero C, Poulett - 142 C
or 174 F above Absolute Zero
but Poulett's data was erroneous

It's calculated that the 50,000,000 stars give to the Earth $\frac{1}{100}$ of the heat given by our sun. This assuming all stars were near the 1st fixed star a Centauri.

Wootton says Ether of space
cannot be at absolute zero as
then it would have no elasticity &
be incapable of transmitting waves

Vel of light $\frac{3}{4}$ of Vel in a Vacuum
This can't explain observations of
light in undulatory theory but
it's wrong ~~and~~ by Emission theory

Stoney says there is not ~~less~~ than
than 10^{14} 10,000,000,000,000,000,000
Molecules in a Cubic Millimeter of
gas at ordinary Temp & pressure.

Then other particle is 10^{40} of a pound

[illegible]

Woolman says if air was heated
to millions of deg. Fahr it would
not like the yellow & transparent light
waves — all say light
waves unlike sound waves in air

Transversely
Days Speed heat of the Aster is at
least many million times that of
any gas

De Valon

Woods - Phil Mag Nov 1885

Concludes

That the Aster has a density that a Volume Equal to 20 Volume of the Earth weighs one pound

Its pressure on One square Mile is One pound

Its specific heat is such that it would require as much heat to raise the temperature of One pound of it One degree Fahn as it would have 2,300,000,000 Tons of water the same amount

& this is required to be able to transmit a wave of light or heat 186,300 miles per second & transmit 133 ft lbs of heat energy from the sun to the Earth in each second per square ft of surface exposed

& it must be everywhere practically

non resisting & sensibly uniform in temp, density & elasticity

See & they swallow this

De Sage theory

1st Direction of stream of particles producing gravity is such that an Equal number of particles are moving in all directions

2nd That the streams are all Equally dense or the total ~~to~~ assemblage of matter forming the streams is of the same density in all parts

3rd That the mean Velocity of the streams is everywhere the same

De Sage says not more than 1 out of 100 of the particles ever come in Collision in several thousand years

John Boston says that Gravity & its effects can be ascribed to the De Sage principle if the path of the particles is great, (less path)

Clavius Mathematically figures that in a gas the mean path of a particle, i.e. average distance which a particle moves before striking another increases in proportion to the square of the diameter of the particle diminishes. By making the particle small enough its mean free path could be increased to any extent.

Challis says. The assumption that all the bodies of the universe are gravitating toward each other is inconsistent with stability all that we require to admit that the effects of gravity hold them as great a distance as we have observed them -

Lesage said the UP came from the depths of space & disappeared therein -

Lesage says matter is porous & the particles went clear thru the planets

3 other men had become similar to Lesage -

Lesage pointed out that in order to explain gravity the particles must rebound from the molecules of matter at a less velocity than they strike -

J Preston no supply of energy to the particles are required or any supply or waste of matter



UP strikes at A & rebounds. This repels the Earth. Sets up waves which travel thru the ether. The action of waves on B is to use B as an inertia fulcrum to push the Earth forward hence no retardation against a moving Earth

Herschel say according to Undulatory
Theory of light - the amount of force
which may be exerted on each
point of space is

1.145.000.000.000 times the
Elastic force of ordinary air
at Earth's surface -
So that the pressure of Ether upon
each square inch of surface
must be 1700000000000 of pounds
The observed phenomenon of
heat & light forces us to accept

Note 2 Masses of Resin rubbed on glass
Repel one another -
2 Masses of glass which have been
rubbed with Resin repel one
another - (ie 2 Masses in
Samuel's Condition generally
repel one another)

A piece of glass after being rubbed
with Resin is said to bear a charge
of ~~Electricity~~ Versus Electricity
The Resin on the other hand
is charged with Resinous
Elec the Volcanic is P
& Resinous X

When body is charged w Elec
there is always an equal charge
of opposite kind of Elec
Somewhere - Every distribution of E
has an equal amount of Elec of
opposite kind

If a body is charged & hung up
in middle of room the walls
have opposite kind of E

All follow Square of Distance
Law -

body on dry glass support
in a Vacuum holds its charge
for a very long time also
in cold dry air

Spec Inducted Cap of a Vacuum differs little from air

All gases have the same inductive capacity whatever their temp or density

If their pressure is raised their Spec Inducted Cap is raised proportionately

Conversely - when a gas is employed as a dielectric charge the plates diminishes at pressure

A Condenser leaves a residual acts as if not perfectly elastic stress recovers slowly shaking & jarring acts same way Newtons discovery Quanta has $1/9$ th the residual capacity of glass

Feeling Spars seems to have no residual capacity, dielectric almost wholly a unitarily

Liquids instantly lose elin

Have Assistent Collect Extremes

Most expansive & least Expansible Metals
Highest & lowest Atomic weight, of Element
Most Oxidizable & least Oxidizable -
Most Cohesive & least Cohesive -
Best & worst Conductors heat,
Electricity, (Metals)
+ extremes of Many other Elements

The UP complexes which form Matter, are suspended in space the same as planets, precisely as at absolute Zero - even then they are in Vibration within & from Complex to Complex

Complexes of 2 UP 4 8 +
Possibly 12 pass thru glass probably & no vacuum is possible with such Complex, until they arrive at combinations greater than say 12 UP
then they are too large to pass thru glass the so called Electron has possibly 18 UP in it

glass rod gives say N Elec when
rubbed = rod sealing Wax
Silk Elec say P when rubbed
Either rod attracts a feather and
repelled by a fibre

glass rod rubbed by silk handkerchief
held in hand will attract the
feather but if silk is not removed
after rubbing don't attract the
feather it's supposed rod rubs handkerchief
Each allow
Rubber when a rod is electrified by
friction, Why

If one Electrified body touches
one not Electrified the 1st body
loses E & the 2nd gains
if spheres of both same radii
be equal in Electrification -

Use a rod Electrified let it touch
the feathers in short time feathers
will fly away as it gets
Chgs with same kind of E &
like repel

If a rod of sealing Wax is Electrified
at 1 End it keeps it for considerable
time while the other end remains
unElectrified

If an insulated rod of metal is used
both ends Electrified, if connected to
Earth, loses it

Gold leaf Electroscope, charged rod
that near leaves fly out if rod
withdraw many observations - called
Electrification by induction -

If any non conductor of metallic
substance interposes bet Electrified rod
& the Electroscope - the leaves being
connected to Earth, the Electroscope
is not affected

If a hollow closed Conductor
(say by chg), however highly
with Elec the whole of the
Charge is found on the outside
surface, & none whatever inside.

On a wire circuit, if by
expenditure of work the difference
in potential is kept up the
Elec may continue indefinitely.
But if no work is expended
all parts of the Conductor
eventually reach the same
potential.

Residual chg in Leyden
jar which takes time to
develop after dischg
is hastened by Tapping.
This is like Magnets -

Says jar can be chg p & dechd
then chg N + so on several
times & then the residual charges will
come out P P P P N as on the colored up

This is line of Mechanical
Working in various amounts of a
glass fibres - it stores up all
these diff chgs & if left alone
it will go thru them again

Specific Induction Capacity		
glass generally	7.8	Cavendish
Shells	4.9	
Rosin & Resin	3.5	
Shells	2.0	Faraday
Sulfur	2.24	
glass mother	1.76	
Ebonite	3.15	Unknown
Paraffin	2.32	
Sulfur	3.84	
Resin	2.55	

Helium	24 hours after Chg	10.2
	Later	59.0
Another Experiment	24 hours after C	8.4
	Later	116.0
		5
Quartz		4.6
Fluor spar		6.5 to 7.2

Gordon

Glass	3.1
Ebonite	2.3
Gutta Percha	2.4
Rubber soft	2.4
Paraffin	1.99
Shellac	2.74
Sulphur	2.55
Carbon Bisulfide	1.81

Large masses of matter like the Earth for instance. Each UP Complex has its Component spheres or Cubes in contact but these Complexs are suspended in Space at present temperature of the Earth. Each complex is suspended in space where UPs bombard it. The space between the Complexs varies with the temperature. At absolute zero there is some space probably not absolute contact.

Isotrope is probably a mass of say Iron UP Complexes at high temp or bombardment which are separated in many multiples. The highest temp would separate all into the fundamental Iron UP Complex. In case temp into double UP Iron Complexes or at low temp there might be thousands. Each would have a vibrating time when struck by a single UP different according to mass. Each UP would rebound from it having increased upon it the vibrating time of that particular ~~Isotrope~~ Isotrope, proceed thru the depths of space & deliver it to 1st piece of Mass Matter it collided with & countless millions would carry away with the 1st at number of Iron lines in the spectrum is accounted for.

I don't see why ~~the~~ UP. should not carry wave motion then spread all the proceeding on their journey separately. If a billiard ball be hit by another both suspended in space there would be a wave of compression forced on the balls in collision & these waves would continue forever.

Probably the elasticity must not be infinitely perfect but close to it.

Enormous displacement of light is nothing more than screening by sun & the spherical disturbance of light from a star is divided towards the sun by collisions w. those proceeding outwards from the sun having less velocity than towards the sun hence light ^{or} are pushed towards the sun

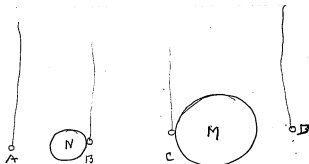
Sound travels say 1000 ft. a sec, this is slow because the wave is between grass matter & barometric pressure, a disturbance of barometric pressure & poorly elastic. It proceeds thru water 4000 ft. because the elasticity of attraction is quicker than barometric pressure. While in steel it is 15000 miles ft. a second because the elasticity of cohesion is very much more perfect. But what which gives light UP upon which is impressed the wave may travel at any speed thru space as it passes thru space void of matter or anything to retard it. But when the UP strikes matter the ~~the~~ waves is imparted to the UP of the complex & there is a wave at a speed dependent on the elasticity of the UP. which is probably sufficient to give a speed of 100,000 miles per second or less. If the UP traversing space have a mean vel of 186,000 miles per second

when proceeding from the sun
have probably 190 to 200 000
Miles per Sec when proceeding
from unoccupied space.
But when they strike the Earth
they transmit the wave of vibration
impressed on the particles to
adjacent UP of the Complex. How
high to free UP between the Complex
to next Complex & clear them
the Earth. These waves throw off
or transfer their Energy to the UP
from space which bombards
it thus rebounding from the
Earth receives additional impulse
over & above that due to
Collision Electricity waves

Necessarily there must be a
slight loss & a lowering of
speed in this transfer with
the Earth. The loss is from
the pressure we call
Gravitation & also heat.
If there was no large body

near like the Sun Moon & planets
there would be no scattering. The
speeds would be the same
(transfer of motion) & the heat
would also be the same & the
world would travel in a straight
line. If the world increased in
size there would be more energy
lost with the Mass & it would get
hotter & if as large as the sun
it would be just as hot,
~~if~~ if speed was the same

In other words planet ^{the} passing
thru space have a temp compared
to their mass of UP complexes.
& this temp is due to a loss of
Energy due to imperfect transfer
of the impact. Like the imperfect
transfer thru a row of steel
balls.



If D hits M C will hit N with a certain pressure

If A hits N B will hit M. but in this case the hit of B will produce a stronger pressure on M than C upon N because the law by transfer then M will be repeller hence N will be pushed upwards M more than M will push N

Expenses.

July 16, 1917.

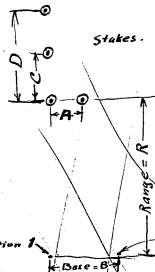
RR Fare New York to New Haven	.88
RR Fare New Haven to Bridgeport	1.75
Telephone Bill New York, New Haven	.35
July 31 To K. Stedman R.R. Fare & supper	1.00

Aug. 1	Trips in own auto, Atlantic Highlands to Atlantic, 100 miles	7.00
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Plus Sept. 12

Sept. 12.	R.R. Fare New York to New Haven	2.79
	Collman's chain and supper	2.00
Sept. 12-13	Hotel Bill (Room & breakfast)	2.00
Sept. 14	Camera and ground-glass	1.35
14	Extra Brown Tibes & cutting	40
15	Antique Acetate	55
	"	60
16.	R.R. fare Greenport to N.Y.	2.85
	Collman	.50

(7. plus 1.00 = 8.00) 11 1.00 = 9.00



Base Line B (Laid Off) =

Distance A (Laid Off) =

Angle A at 1 =

Range (Calculated) =

Distance C (Laid Off) =

" D " " =

Angle C at 1 =

" C " 2 =

" D " 1 =

" D " 2 =

Distance C (Calculated) =

" D (") =



Range Measurements from Station A
Horizontal Angle of Middle Window -
Next to Top Floor - 14.5°
h.c.c.

0.007

0.007

0.007

0.0073

0.0074

Actual Dist. bet. windows = 14.5 ft.
distance 14.5

If middle window is maximum
to be 60 ft. range 7200 ft.
the distance between windows.

$$x = \frac{(7200^2 - 120^2) \times 0.0001293}{160.5 + 7200 \times 120 \times 0.0001293}$$

$$= 149$$

$$y = r\theta = 7200 \times 820 \times 0.0001293 = 74$$

$$\text{dist.} = \sqrt{149^2 + 74^2} = \underline{165} \text{ ft.}$$

160.5

Station B.

Angle of Masts - Inches

.0880

.0876

.0871

.0871

.0880

Average Diff. from Sta. A = $\frac{170}{10000}$

Angle of Stacks -

.0212

.0213

.0202

.0213

.0201

Average Diff. from Sta. B = $\frac{37}{100000}$

Range Measurement from Station A
to far (Schmerhorn) Mast.

Angle of Mast-Height.

Inches

.0677

Height of Mast.

.0678

Let. 60 and 65 ft.

.0671

This inches range between

.0679

7200 and 7800 ft.

.0674

.0672

SPLASH PARALLAX
EXPERIMENT.
July 31, 1917.

SIGHTING ON ANTENNA
MASTS & ON SMOKE-STACS
of COLUMBIA UNIVERSITY
FROM PALISADES.

STATION A.

ANGLE OF MASTS - Inches

.0758

.0754

.0759

.0751

Angle of Stacks

.0163

.0168

.0164

.0165

.0166

Distance Bet. Stations = 160.3 Ft.
160.4

Distance Between Object
III & IV as determined approx-
imately from maps = 3050 feet
This is accurate to about 50 feet

Distance as determined by splash
parallax method = 2945 feet

Hence error is about 105 feet
 ± 50 feet

Measurement of Actual Distance
At Sandy Hook, distance
Object I & II, and between III & IV.
Sept. 11, 1917.

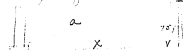
Object I & II

Helicopter Readings, shooting from
height of 75 ft. up the mast:

.1686, .1687, .1686, .1688

Average = .1687

Length of stick sighted from = 422 ft.



Oblique distance $a = \frac{422}{.1687 \pm .0002} = 382$ ft.

Horizontal distance $x = \sqrt{382^2 - 75^2} = 382 - \frac{1}{2} \frac{5625}{382} = \underline{\underline{375 \frac{1}{4}}}$

Distance as determined by splash method
as within = 344 feet

Error = 31 Feet

~~From this may be seen~~

Distance Calculations. Obj. II & IV.

Obj. III
Range, Yards
Prevailing ground

Obj. IV
Range, Yards

b = 336 feet
240 - 40

$$y-s = .0166 + .0044 = .0210 \text{ mils.}$$

$$= .0210 \times 1000 \text{ yards} = .00261 \text{ radians}$$

$$x = \frac{18060 \times 1000 \times .00261}{336 - 18060 \times .00261}$$

$$= \frac{951000}{330 - 47} = \frac{871000}{283}$$

$x = 2945 \text{ Feet}$

Distance bet. Objects III & IV

Probably correct to 100 yards.

Distance Calculations. Obj. I + II.

Obj. I
Low Base Mark.

4

Obj. II
High Base
Mark in Tower

20.0' = 6.232 ft.
3.2' = 0.975 ft.

$$Y-h = .0151 - .0124 = .0027 \text{ miles}$$

$$= .0023 \times .1243 \text{ rad.} = .000286 \text{ radians}$$

$$x = \frac{R \cdot (Y-h)}{b - R(Y-h)} = \frac{20150 \times 20100 \times .000286}{332 - 20100 \times .000286}$$

$$= \frac{115370}{332 + 5.5} = \frac{115370}{337.5} = 342 \text{ ft.}$$

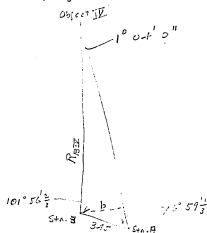
$$y = .0135 \times 20100 \times .1243 = 35 \text{ ft.}$$

$$z = 344 \text{ feet} = \text{Distance}$$

bet. Objects I and II

Probably correct to 20 ft

Range Calculations. Obj. III + IV



$$1^{\circ} 04' = 0.01861 \text{ Radian} = \sin 1^{\circ} 04'$$

$$\sin 76^{\circ} 59 \frac{1}{2}' = .9744$$

$$\text{Effective Base Line} = b = 336 \times .9744 = 336 \text{ Ft.}$$

$$\begin{aligned} \text{Range } R_{BIV} &= \frac{336}{.01861} = 18,060 \text{ Feet.} \\ &= 6,020 \text{ Yards} \\ &= 3.42 \text{ Miles.} \end{aligned}$$

Range Measurements.

Angle Bet. Station A & Object II at Sta. B.

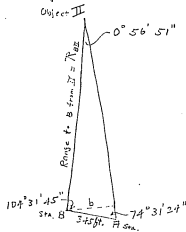
Repetition	Ver. A	Ver. B
	180	0
I.	75° 29'	104° 31'
II.	29° 3'	180° 57'
III.	133° 35'	16° 25'
IV.	121° 53'	58° 7'
Average	$= 104^{\circ} 31' 45'' = 104^{\circ} 31' 75''$	

Angle Bet. Station A & Object IV at Sta. B.

Rep.	Ver. A	Ver. B.
	180	0
I.	78° 3'	101° 57'
II.	23° 53'	156° 7'
III.	125° 50'	54° 10'
IV.		

$$\text{Average} = 101^{\circ} 56' 40'' = 101^{\circ} 56' 67''$$

Range Calculations. Objects I & II



$$\frac{R_{BS}}{\sin 74^{\circ} 31' 24''} = \frac{345}{\sin 0^{\circ} 56' 51''}$$

$$\sin 74^{\circ} 31' 24'' = \sin 74^{\circ} 31' 4'' = .96374$$

$$\sin 0^{\circ} 56' 51'' = \sin 0.9475^{\circ} = \sin .01653 \text{ rad.} = .01653$$

$$\begin{aligned} \text{Range Ratio} &= 345 \times \frac{.9637}{.01653} = 20,100 \text{ feet} \\ &= 6,700 \text{ yards} \\ &= 3.81 \text{ miles} \end{aligned}$$

$$\text{Effective Base Line} = b = 345 \times .96374 = 332.3 \text{ Feet.}$$

Range Measurements.

Angle bet. Sta. B and Obj. II from Sta. A.

Ver. B	0	74° 31' 30"
Ver. A	120	105° 28' 30"
Repetition II		
Ver. B		
Ver. A		33° 1'

Rep. III

Ver. B	0	
Ver. A	180	
Repetition I:	Ver. A	Ver. B
	105° 29'	74° 31' 0"
Rep. II	30° 57'	149° 03'
Rep. III	43° 06'	136° 22'
Rep. IV	118° 2'	61° 54'
Rep. V	167° 58'	12° 37'
Average = 74° 31' 24" = 74° 31' 4"		

Angle bet. Sta. B and Obj. IV from Sta. A.

I	Ver. A 105° 1'	Ver. B 76° 50'
II	26° 2'	152° 58'
III	50° 58'	120° 2'
IV		
V		

Average = 76° 59' 20" = 76° 59' 3"

Helionmeter Measurements.

Station B.

Angle bet. Objects I & II, Aver. = .0138
 Inches .0137 .0138 .0139 .0140 .0138 .0137
 Black ~~stick~~ to the left in Helionmeter

Angle bet. Objects III & IV, Aver. = .0166
 Inches .0165 .0167 .0166 .0167 .0167
 Black stick to left.

Station A

Angle bet. Objects I & II, Aver. = .0141
 Inches .0139 .0140 .0141 .0142 .0141
 Black stick to left in Helionmeter

Angle between objects I & II, Aver. = .0044
 Inches .0043 .0044 .0044 .0044 .0043
 Black stick to left

Note added Sept. 11th, 1917

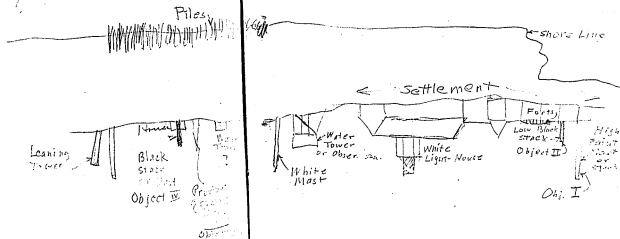
Object No. I identified as western
winery and
Object No. II as Smoke-stack of
Central Power Plant

Object III Small Storage Range-Tower

Object IV Incineration Stacks

Added by Lieut. Jephth Cohen

aching, August



Splash Parallax Experiment

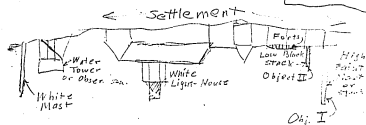
Aug. 4th, 1917

Weather - Rather Hazy.

Sighting from Atlantic Highlands on
Objects on Sandy Hook.

Length of Base-Line = 345 Feet.

Objects as seen through Helioscope
at Station B.



70 57
100 58

123 57
423
100 58
100 58
100 58
100 58
100 58

100 58

179 60
100 58
100 58
100 58
100 58

100 58
100 58
100 58
100 58

100 58

100 58

100 58

100 58

100 58

Notebook Series -- Notebooks by Edison
Notebook, N-17-00-00.3

This undated notebook was possibly used during August 1917. All of the entries are by Edison and pertain to his work for the U.S. Navy during World War I. Included are notes on the way torpedoes work and how they sound, as well as Edison's reactions to newspaper reports of an oil tanker sunk by a German submarine. Additional entries consist of notes pertaining to poison gases, with references to the Watts dictionary of chemistry. The front cover is marked "No 2." The pages are unnumbered. Approximately 30 pages have been used.

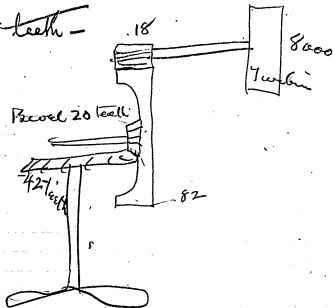
Notes on Torpedo -

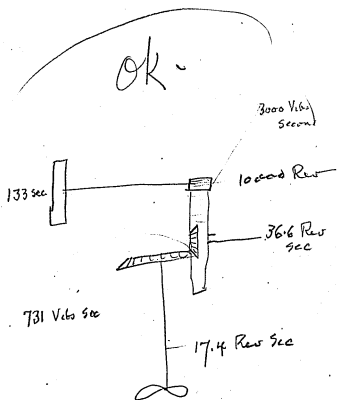
Pinion on Turbine, 18 teeth

Turbine makes 8000 Rev

min - meshes with 82

teeth -





First pinion gives 2400 per second

Bowl gear gives 584
almost 4 to 1 -

First pinion 133 Rev sec
wheel 29.3
Gears 13.9

Lewitt says the turbine runs -
10000 Revolutions min -
This will alter the above
3000, sec
731. sec - 4 to 1, nearly

It should be 600, 75 per sec

Gyroscope Run about 13000
Makes no sound after its
started, but compressed
air impinging on the
teeth of a $1\frac{1}{2}$ " dia spur
gear wheel $\frac{3}{8}$ " face
both about $\frac{1}{16}$ " thick
gives a high whistling
note, ~~the~~

Enoch in CG and Turner
Thursday 23rd first alarm
Hann Sub + a Oil
Tanker, Sub gave 175
Shots - Tanker 300

4500 yard & less range
Sub fired a torpedo it
missed, boat captured
German Capt. said he
set his torpedos at 15ft
the tanker draws 15
he said it was the same
he missed —

Tanker Zig Zagged although
Submarine was
chasing far astern,
had 2 3" guns 13 guns
German had 4" gun
forming for action

if so why Zig Zag
Most of the battle was
at 7500 yards - started
at ~~1000~~ 9000.

Only once did we hit
tanker & that on
superstructure —

Heb only got one in
Conning tower

3000 Sec wants resonant Column

2.15" Long

or for 731 sec -

8.9" Long

Trichloroacetamide, unstable, don't keep
Violently attacks eyes & mucous membranes.
(Watts) 3rd sup p 2 under acetamide.

Sol what liquid dissolves the most
Acetone -

Aluminum powder mixed with TNT
ditto Mg - ditto Zinc dust,

Pkt Small Can Oleum in sharp shell -
5% of the bulk -

Can of pyrogallate Non-for smoke
Ampor blackens in air

St Oxidilamide readily sol in
Alcohol - to clear liquid
decomposed by water -

in Paris 6 to 8 mils of solid
matter as dust per Cubic
Meter 1 1/2 @ 3% will dust on sheet

1 meter squin on salmuyft 45 ft
above the South in Paris -
25% organic

^{decolor}
Alzoxylene Epilodes on
heating - (Watts 3rd) exp
p 215

Metadiagobenzene Sulphonic
Epilodes - Dangerous body
when perfectly dry explodes with
great violence by striking
with a Spatula

Crystallizes from water then
not so explosive - can be
Exploded by striking with a
hammer (Watts 3rd)

Rec p 229

also Ortho-diagobenzene Sulphonic
acid ^{crystallizes} detonate all angles when
heated in platinum foil.

Rec p 230

Decomposes giving white fume

Amide of Nitrochlorobromobenzene
Sulphonic acid - Watts 3rd p
249-

Dichlorobenzene acid.

y acid Volatilizes with Vapor
of water, sublimes very
beautifully even at low
temp Watts 3rd 263

Dinitragobenzene acid detonates
also its Salt detonate Watts 3rd 274
275 - Metadiagobenzene Sulphate
detonates.

Parabromobenzyl Bromide.

+ other attack nucleus nambrom
3rd Watts 314

Teas incl. Boric Trihydrate
Watts 3 346
its anther, burns with green
flame

Boric dihydrate liquid,
Spontaneously inflammable
Watts 3 346

Monobromocamphor
sublimes Easy

With Carbon disulphide -
When Nitrogen Monoxide
passed over pumice stone
moistened with CS_2 a green
mixture is produced & gives
off flame very rich in charcoal
rocks if burnt in a Bunsen
burner constructed so no
explosion it produces a
flame superior to Magnesium
Watts 3 407

Cerium Metal burns with greater
brilliance than Eos Magnesium
goes off easier than Mg
set off by friction -
brilliant sparks by striking metal
with flint -

Salts decomp by water
Mercuric sulphate, (turpeth)

Bi: Nitrate normal.

Antimonous Chloride

Bi trichloride

Potassio-Calcic sulphate

{ Chrysene sublimes $250^{\circ}C$
Dibromochrysene $273^{\circ}C$ Watts
3rd 464

Tetranitrochrysene - Watts $300^{\circ}C$
+ detonates at strong heat
sparingly or nearly useless in all solvent

Acetylene in Acetone
large flame with insufficient
oxygen be good for
making black smoke

Tetranitrodiphenylmethane
Melt. 260 @ 270 + detonates
slightly at higher temp -
Watts 3-653 soln - anilin

Ethoxythionyl Chloride
slightly fumes (liquid)
Watts 3-53 743

Read 3rd sup watts
#1 -

A-Dinitropropargyl salt
Explosive - watts 3-1492

Diazophenyl Nitrate Very Explosive
but burns without detonation leaving
lots of charcoal -
watts 3-1524

Arsenious dichlorophenide
liquid Exerts a violent corrosive
action on the skin

Fumes in the air -
Boils 255 Not altered by
water - (1 atom H₂O) -
Watts 3rd 1552

Arsenic Oxychlorophenide
Crystalline - MP 100 fumes in
the air H₂O converts it to
phenylarsenic acid -

Phosphoryl Tetra bromide -
sol. - fumes strongly in
the air

Vitro-phosphoric acid
MP 132 explodes at 200 C
Watts 3-1579

Phenylphosphine, liquid
inflames in contact with
free O - unless cooled
Watts 3 1580
Look up the phosphine

Phosphorus Pentachloride
liquid attacks many forms
in des - comburs with H₂O
§

Propyl Chloro-carbonate
strongly attacks the eyes
Watts 3 1676

Trimethyl sulphine Chloride
The Chloride + iodide
Melt 140 at their 2-phase
Watts 3rd 1849

Normal Ammonium Sulphite - heated
gives off white vapors

It seems that it is formed by
heating sulphite & considerable
Thioanite bef. H₂ combustion
Lakes plumb & Sulphite Valdeph
wants water -
Watts 3, 1868

Tetra-bromo-o-acetic Ether
Only formed strongly in the air
decomposed by water
3rd

Tetra-brom-ethyl Oxide
forms in air decomp by H₂O
3rd 1908

Telrantra - Anthracene
Explos - water 3rd 1914

Titanium dichloride -

Thrown on water it heaves
like red hot iron & if
touched by a drop of water
Catches fire

Trinitrophenylphosphonic acid
its salts Explodes violently
when heated

Acetone absorbs 44% in large quantities
perhaps may be absorbed in small
quantities of water

~~Strong~~ By dropping acetone
into fuming nitric acid contained in
a flask & immediately cooled & adding
water as soon as fuming ceases
heavy oil produced which on heating
Explodes with violence gray off Red paper

Monochloroacetic liquid
BP 117 acts strongly on eyes
Copious flow of tears.

Dichloroacetic attacks nose
& eyes with violence, liquid chloro
skin wound difficult to heal
Insoluble in H_2O , Sol in Al & Ether liquid
BP 116 C - Boils at 130 -

Chloroacetyl liquid BP 55
fumes slightly in air
Vapor attacks eyes & respiratory organs
strongly - Decomposed by water
with great violence

Peroxoacetyl thick liquid
Explodes with great violence
when drop heated on watch
glass - Powerful Oxid agent
Boils 1st under acetyl

Acrolein - liquid BP 52.4 C
its Vapor is so intensely irritating
that a few drops in a room makes
atmosphere unsupportable -
2 1/2% in H₂O - Readily
in ether must be freshly kept
from air as it oxidizes
(Unstable) NG

Chloride Aluminum. MP 190 C
fumes in large masses
fumes in the air - with Vol
under Aluminum - good

Nitroanisic Acid Explosive
when heated suddenly -
MP 180. scarcely sol in
H₂O with Vol 1 302

White pow. 26 oxy chl Cryst

Antimony = Watts Vol 1

Stibicriamyl

liquid - not spontaneously inflammable
Very viscous below 20 C

SG 1.333 at 17 It fumes
strongly & decomposes to a
white powder
Drop on paper exposed to air
chars paper by heat of oxidation
Insol in H₂O (Examine)

Stibicriethyl

SG 1.32 liquid BP 158 C.
Insol H₂O, dissolves in ether readily
Drop exposed on glass rod
Emits thick white fumes
& fumes like fumes
with white strongly luminous
flame (Water Examine)

Nitrate of Ethylmagnesium
Cryst - EtH_2O slowly in H_2O
when heated gives off white fumes
which immediately take fire
& then explode with large
white flame just like a
mixture of Nitro & Charcoal
Very stable salt, not decomp
by strong cooking Sulfuric
acid

Arsenic Chloride Better of
Arsenic - fumes in air
BP 132 - Evap in air at
and temp. Very po & highly
poisonous - cheap

Arsenic Fluoride -
BP 63, fumes strongly at
and temp. 4 times as heavy
as air - drop of liquid on
skin produces painful vesicles
long white trail cheap

Arsenated Hydrogen Liquid
30 C don't combine with acids
or bases. Extremely poisonous
& great care must be used in
handling the gas, (cheap)

Arsenmethyl Dichloride
Liquid - BP 133 don't fume
net/decomp by H_2O dis in it
Exerts a most violent action on the
mucus membrane on smelling
it the eye nose & whole face
swell up & peculiar lacerating
pain is felt extending down to
the throat, (cheap)

Cacodyl - fumes in air &
spontaneously inflammable
Very dangerous to make
both from fire & poison

Chloride Cacodyl - don't fume
but vapors from heating
liquid Cacodyl fire BP 100 (liquid)

beets emit a pungent suffocating odor, when inhaled in rather large quantities makes eyes sore & bloody & membrane becomes dark.
sol^d H_2O solⁿ - alcohol all proportions -

Cyanide of Cocacyl is the very limit of poison -
Crystalline MP 33 C -
Boils 140 C Vapor S.G. 4.63
Most poisonous of all the Cocacylic Compounds
few grains defined as vapor thru air of a room

Excites giddiness, delirium, numbness of hands, feet & even loss of consciousness - These attacks are however of short duration providing the person escapes in time - Cheap -

Arsenide of Tetrayl forms compounds in the air don't fore spontaneously (unstable)

Nitrobenzoic acid MP 127
sublims 140 C no residue
Vapors excite coughing
dis in 400 pts H_2O

Chloride Benzoyl -
BP 196 Vap Den 4.97
makes eyes water - decoup by H_2O group HCl +
Benzoic acid solⁿ - all proportions in CS_2 insol^u in water
(For smoke with NH₄)

Boron Chloride liquid boils
17 C fumes in damp air
V Density 4.06 - yields HCl
Boric acid -

Fluoboric acid thick
liquid, only fumes in
the air boils above
100 C distills without
alteration, highly corrosive
Cham organic bodies

Acid Borate of Ethyl
(liquid) gives off white
fumes in air at 200 C

Butryal -

Monochlorinated Butryal
Liquid - BP 141 C
miscible H_2O pungent tear
exciter. diss. CCl_4 -

Dichlorochloride Carbon
Very irritating to the Eyes

Chloral - oil,
SG 1.5 Vapor Den 5.13
excites copious flow tears
acts on skin like alkali peel
of next day
no acid reaction
Combines with H_2O for
Chloral Hydrate

Chloraldehyde
Liquid - gives off excessively
persistent vapors

Chlorides of acid radicals
mostly fuming liquids -

Perchloric acid (liquid)
fumes, very volatile
B.P. 178.2 fumes densely
white, due to decomp by
 H_2O - most powerful oxidizer
Known sets organs on
fire instantly, amounting
to actual explosions nearly
Equal to Chloride of
Nitrogen - 17

Very dangerous to skin
takes up to 24 hrs
unstable also
Contains sometimes
explosive

Chloroperochloric Acid (liquid)
forms extremely dense fumes
in contact with acid water.
C-921 -

Chlorocyanogen (liquid)
attacks Eyes & nose violently

Chloropicrin -
liquid B.P. 166
B.P. 120 - attacks Eyes &
nose violently -

Oil mentioned about same effect

Acetylene Combines with
Copper & also Silver to
make detonating compounds

Bromoacetylene gas
Spontaneously inflammable
Liquifies at 45 lbs pressure

For traces in 3" slugs shells
bore holes in base of projectile with
solid very slow burning fuse leading
to small chamber of black
powder making big smoke when it
goes off suddenly at 2 or 3
places along fray along -

Notebook Series -- Notebooks by Edison
Notebook, N-17-09-15

This notebook, which covers the period September-October 1917, was used by Edison aboard the USS *Sachem* in connection with his work for the U.S. Navy during World War I. Many of the entries relate to visibility at sea and to camouflage experiments conducted under various light and weather conditions. These include experiments with ships camouflaged by different canvas panels, as well as experiments with painted boards of different shades erected on shore and viewed from Long Island Sound. Also included are notes on devices to measure the amount of light reflected at the horizon. Additional entries pertain to smoke bombs and to the amplification of sound underwater for the detection of torpedoes. On page 170 is a list of projects in progress, along with Edison's approximation of the "percent finished." Among the projects listed are camouflage, periscope sighting, a Smoke bomb 3" gun, an underwater projectile gun, a Lyle gun smoke bomb, and "still" and "moving" torpedo detectors. Edison's notes indicate that Mina Miller Edison accompanied him aboard the *Sachem* and that the vessel cruised among Gardiners, Plum, Fishers, and other islands, using Greenport, Long Island, as a base of operations. The notes are continued in N-08-09-10.2. Outline drawings of two freighters have been inserted into the book. The front cover is marked "Front." The book contains 197 numbered pages, a few of which are blank.

Sept 15 1917

(1)

9 am

Semiclaudy day, whole covered with clouds not thick, can look at sun only for an instant. Some thin patches all over, wind moderate breeze. Very few white clouds but a small swirl rolling across.

$\frac{1}{2}$ mile off front. Boards in shadow

Lightest	NO 6
Next	1 & 5
"	4
"	3
"	2

243 are close to tint,

NO 1 is the faintest painted part of Jackson.

NO 2 is 90% lampblack stripes 10% white lead stripes, mottled by cross lamp.

#	3	80% Black	20% white
4	70	"	30
5	60	"	40
6	50	"	50

2

1030 am Cloudiness abt same

all boards lighter
order of shade same as at
gami - but 5 is shade
lighter than No 1.

1050 - Cloudy - can look
at sun steadily thru
clouds -

all boards shade
darker but very little
this is surprising +
shows increasing deformation

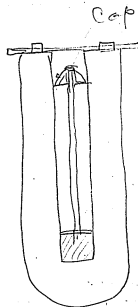
light by reflection

~~from 1st~~ Cloudy

temp - 1/2 way down

plus 20° = by squaring
the 2nd No 6 is least visible
No 5 next at 11:00 am

3



2" of fuse.
+ Cap -
5 seconds

No 6 is 50% black it is
probable that at this hour
& condition of cloudiness
that 80% white 20 black
would be good models
at 4 miles or so, & that

4
both sides of sun & shadow
could be made movable
at 4 or less miles

But not in bright
light -

Therefore with
proper tools & more
canvas we are ok

both sides on S S
Cloudy Days I I

By Carving Rolls
of 95 90 80 60 40 30
10 + 5 black

We can according to
course of ship, change
to suit Sun on cloudy
& Hazy days

5
days & do considerable on
clear days

Only necessary to put
rolls in position when
Danger Zone is approached
& not at all when in a
great storm when swimming
can't operate. -

1 Roll 4 turns 1st side - Dark
1 " 4 " other " light

for the morning when in
shadow light put roll
goes on that side & dark
roll on other side -

Roll changed at noon
or where shadow both sides -

6

1155 AM No 6 by squinting
way down from Sackham Road
ft away. disappears -

Still cloudy - white caps

East all over on sea

Can't look at sun but
an instant -

Wind fresh -

Considerable blue appears
in sky

Not nearly as hazy
as it was at 1050 AM
about the usual haze
judging from the Island
as we had in Japan
1 or 2 - + much less
than with 3

7

1205 Noon Sun obscured

Can look right at it

6 still least visible -

2 most conspicuous -
sky line is off course clouds

Want of light seems to be

Controlling factor

showing necessity of
95% black to 5% black

Apparently the light in sky line don't change
be sure of this.

12 15 pm

Can still squint partially out

No 6 from Sackham

2 is still very black
Sun obscured under dark
cloud

Think if 2 looks lighter
than 6 were used be ok

or say 70% white

8

9

1220 pm Sun out of black
 Cloud into white cloud
 No 5 lead Vis by 2 point
 2 still Black

Dinner

1235 pm Sun seems obscured
 by white clouds -
 #6 best for maneuverability
 2 black

as sun gets momentarily
 brighter at times
 #5 is most maneuverable
~~yet the sun shows~~
~~very bright reflections~~
~~on waves - when~~

To make all the shades it
wants 1 Roll with 5 blacks
tints & 1 " " 5
whites tints -

100% white ^{possibly stain}
for 100%

90

80

70

60

50

40

30

20

10

whites -

1250 pm Sun Remains brown
white cloud can just look
no 6 most movable still
2 blackest yet sun shows
very bright reflections on
waves looking west
but none looking East

This must be due to reflection
of clouds as foot is shady
Color

Y just note complete rule
west very bright reflection
on water & dull between
so its rifts in the clouds
The foot is obscured &
not in a Rift

1 pm rift ^{more slightly} open.
on foot - ~~at~~ 3 most
invisible -

When rift closer 6 is
best,

It might be called a dull
day. Clouds thick & thin
& sun nearly all time
covered with either thick
or thin clouds with
rifts from dark to light
clouds & occasionally
a clear sky rift.
but 95% ~~sunlight~~,
obscurity of some kind
with 50, 50 best,
apparently should
be either 60 or 70 white
white caps look very
white east -

130 fm Rft. lighters
No 3 is least visible
its between 3 & 4
Varying as closed Edge
of rft. chambers -

Now 4 & 1 least
visible -

#2 blackish -

150 fm #3 best. (rft)

No 2 getting lighter

No 1 too white -

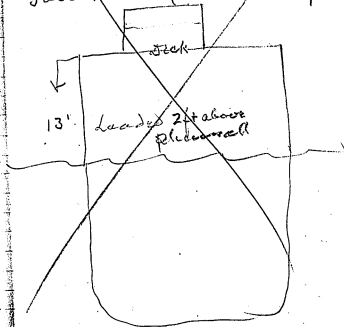
instantly changed to

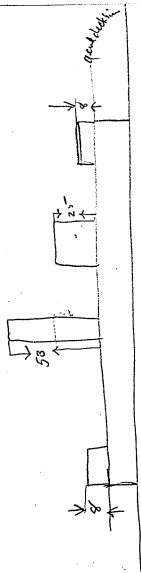
#1 & 5 most variable

sky line seems unchanged

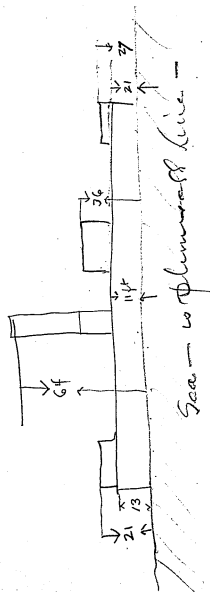
14

Current Cargo Boats, 15
5000 Ton General Type



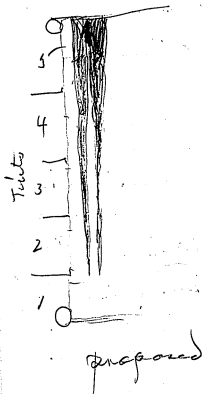


16



Island

17

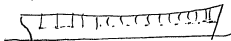


Canvas we have been using on
Dachen .024 thick -
yard 30" wide 36" long

The reason ~~it is so dark~~
why #2 is dark today
all time is no general
sunlight only occasional
sifts ~~to~~ Wind from N East,

247 psi - No 1 from Sachem
by segment is perfect sky line
& invisible at one time for
10 seconds then sun
changed by cloud
this shows if could get
into right light steady couldn't
see 1/2 of ship 1/2 mile away

from deck of sash we
are so close less than 1/2
mile, pblig 1/2 the balloon
parts of band have a
sea skyline -



We can have hooks put on
side of boat which 30" wide
cans along tinted with
stripes, & easily removable.
Say 4 ft across water
line - stripes fastened at rail
& lying flat against
side of boat,

Standing on Pilot House deck
all boards have a sea
background - in condition
of the light 3 is best.

When sun obscured by a
white cloud so can
just look at sun
suddenly became lighter
than No 2, best against
sea, squinted couldn't see it

Another change in light
Against Sea background
No 3 most invisible
against sky line.
No 6 most invisible

22

125 ft of $\frac{1}{32}$ Canvass - 23
 024 truck but allowing it to
 be 031 truck rolled up on
 4" rails. tight well be
 8.71 inches deep -

probably with creases will
 not exceed 12" 125 ft
 should give 5 into 25 ft
 each high from deck to
 top of br. logs -

1st Movie Quecks NG
 2nd " fair obscure - 10x10
 ft -

Wants 10 to 15 times as
 much burnt at once to
 do much good, 30 times
 would obscure 10 @ 8 ft high
 180 ft long - it deep down

24
Wind fairly good breeze
no white caps. sun shining
Three sieves #2 60 and
being least visible - 345 per
in 2 seconds (no 14 4)
best as cloud passed

Fire can of oil with overactive Sodium
or Calcium to act on fire K would
be better.

Can of ammonia bottles HCl Conc
when bomb busts gives smoke
or Pags soaked in each in
bottles, little Kieselguhr
soaked in each -

Chloride Iron Can & Black
Sulphate Iron -

25
Conc. 40% NaOH + strong Sol pyrogallol acid
+ Conc phenol Alkaline -

Barium Nitrate is most soluble Barium
Salt + H₂SO₄ in another can -
or a very soluble. Salt of H₂SO₄ -

Concentrated Sol of Aniline black +
other dark dyes -

Paraphenylenediamine + Soda - oxidize in air
mixed together -

ditto. Paraminodiphenyl -

Anhydrous HCl absorbed in an
alcohol or other non water solvent
into which is passed
ammonia - on shell burning
the alcohol evaporates -
The gases are free in presence
of water in the air combines as NH₄OH

26

Life line No 4 Callipers 5/32

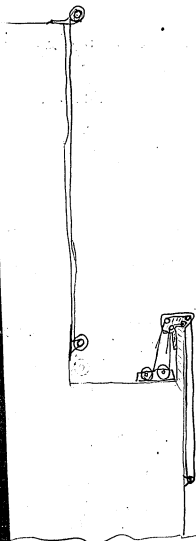
" " No 7 " 15/64th

Temp - very flexible -

Think that anhydrous gases
 absorbed in an anhydrous volatile
 liquid, which, ~~which, perhaps,~~ will do the trick as the gases
 will only combine to give solids
 from water in atmosphere -
 gases will remain suspended
 till enough water absorbed to
 give the solid by combination -
 The moisture of the atmosphere
 being the necessary ingredient
 to form the combination

See what anhydrous SO_2
 SO_3 is soluble in -
 + chl Ba also sol.

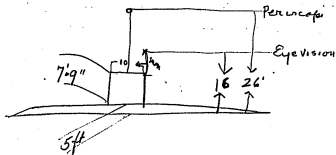
27



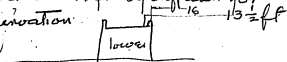
28

Think the Govt should put say 9
Camouflage men + vessels
Complement of gunners on
every Camp ship + furnish
all the Camouflaging
apparatus -

29



Greatest eye vision on German submarine
man standing on top of the Conning
tower is 16 ft. by difficult for
observation



but for constant observation of
man standing on top of tower
is $13\frac{1}{2}$ ft, the amount I have
all along assumed for eye
vision -

The longest periscope is
26 ft from water line -

the periscope is not more than
6" in diameter, probably
5"

The width or diameter
of Tower is 10 ft which
makes a platform
or deck.

The shorter periscope is
about 21 to 22 ft.

I notice in Board tests
standing on deck 11 ft
above water that 1/4
of the bottom of board
~~was~~ was on the
Sea back ground

In tests with 10 board
measures this exactly
when bottom board
is free of sea back
ground. Observing
from 192 for fuel
test but from ~~polymer~~
at other times -

With Convoys - the
smoke etc of destroyer
will be notice if
presence of. Troop ships
or Cargo boats, If
destroyer would
be careful about
smoke it would be

better,

The best plan is for
Cargo boats to keep
apart, & destroyers
30 min steaming time
away & no convoys

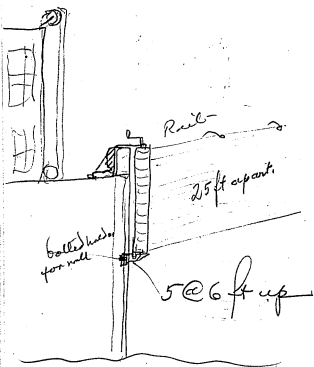
Torpedo boats
should be ~~kept~~
camouflaged

our war masts should
be camouflaged above
the turret so enemy
could not see from
their masts our ships
from a distance —

Roughly require
21000 yards 10 tnts
for 5000 ton Cargo boat
probable cost for Camo
\$5000. \$

Camoscope
Camometer

34

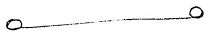


35



Camouflage section

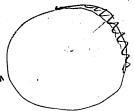
Possibly we can
 paint canvas on both
 sides then instead of
 Changing Rolls from
 sunny side to shady
 side ~~can~~ can shift
 rolls turning inside
 out.



Sept 19th -

My watch is 10 min slow - all time
 is by my watch.

4.30 am Rosey East stars out
 all boards black
 Can see that 89410 not so black
 as others Rosey extends



Woods Glance
 say twilight
 starts 4:14 am

Watch 11 minutes slow

My watch 4:45 am (incorrect)
 Its light enough to
 read by - shuns on water

Sun not up -
 4:46 getting very red
 see clouds along horizon

Sun just a little to
~~left of~~ right of lock
 Boards still black
 8000 show lights

Can certainly see incandescent
 lights - to ship & through
 Suction Stern points dead
 to boards -

Can see Plum Island
 shore plain - ditto on
 right - 3 miles -

452. Can read fine print
 Can see 1 star dead overhead
 Can just see light house tower
 dark - (get distance)
 Can see Plum Island 4 miles
 light house

Sky overhead seems clear
 yet along horizon there is a cloud

It is going to be a very
 clear day I think -

Land on every side even in
 distance is plain with
 2 or 3 & very little haze
 although sun is not up -

The Aurora is now very
 brilliant - but can't see
 the light house on right
 a long distance away
 see light. 5 am see
 Plum Island light house
 with glasses -

Boards very black

Sky line in Aurora very
 dark at horizon extending up
 twice distance of back then

dirty then clouds show faint red
then redder, then very light sky
above yellow color & very
bright.

House on plain Island
White, more so than
sky line - bc ok on sun side

5.10. am sun not up yet
Boards dark but can see
tint & 9+10 getting

much brighter -

5.07 - can see 8 9+10 are
white then glaucous -

5.10. star above gone -
8 9+10 getting much brighter
but much darker than
sky line -

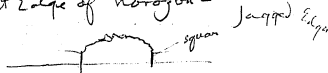
5.12. Rosey fading out fast.
~~star~~

8 9+10 commencing to show
difference by squinting -
I can see they are whitish
full eye but darker than
sky line -

5.20. squint shows 8 9+10
much better - well and squint
show decided white -

7 shows dark 1 is black

5.22. Sun Edge appears
at Edge of horizon -



8 9+10 - squints decidedly

5.25 sun all above horizon
hard to look at, very bright
yellow. showing rather clear
horizon

5.27 - by powerful squint
can almost make 89+10
disappear -

Sun now lights up sky &
islands. Landmarks prominent
which were not clear before
it emerged

5.35 - 89+10 by eye look
white but are too dark for
skyline - the skyline
between bands is too yellow
as not whitish - if it was
they could have been squinted
out long ago. Color whitens

here in morning
it would need barbed wire
low down to get yellow
thrown on ship as
long as skyline next at

still continue to have some
of the before seen rise across.
It is possible that the
color before descending after
sun comes up that gives
the whole band -
This I think can easily be
overcome with increasing
fast light to give same color
as Aurora & sky line after
sun is up

5.52 - 89+10 still not
able to squint away much
still entirely unsatisfactory
on account of yellowish
skyline - which is very
different from white,
possibly as only need white
in morning 9+10 can have
2 yellow shades (12)

44

The last point to make all white can be tinted yellow - or perhaps all the white after - AD 6 can see more more or more yellow till 10 is early morning Aurora -

With hole in paper all boards are dark. no difference between them -

With Open Eye you notice the shadows decidedly but as against sky line they stand out all alike as dark. ^{6 am} Sky line getting less yellow

It is doubtful if yellow tint which paint on boards will do. it seems to be worst of light & perhaps tint at 6.05 yellow tint almost gone. Sky line very bright with light whereas white is just seen & needs light, perhaps Carbon

45

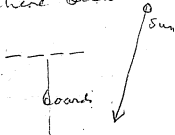
lamp foot light will aid

6.16 am still not enough light on 10 -

6.20. Can't see any yellow tinge to sky line hence yellow tinge probably not necessary
+ works light =)

Can see with glass that light houses way off a right of many boards so it pretty clear sky today but 4 miles clouds ~~are~~ around horizon where seen where along

Not head right angle



46

630 am

Can now notice that 10 is getting more light & squint shows the different bits of all very plainly but very unsatisfactory

6.37 - more dead'ed change to the better by squint

645 am

Think if there was clouds overhead NO 10 would be OK but sky in blue overhead

& no clouds to reflect back on #10 it gets its light from reflection from clouds which has slight walls 1" high suppression. (very little wind) the clouds on horizon sky line

Clouded sky line in this coat looks dark (10) clouds

47

720 - #10 too dark yet

740 - 10 getting better, getting more white & sky line getting less bright -

Very decided def in tint from 1st 10 - squinting makes 10 more conspicuous as it

a want of light whereas - too much light is necessary to use squinting -

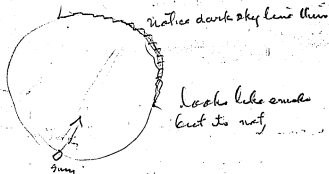
805 am - #10 coming

Closer to tint of sky line but not light enough on it

8.35 - #10 hasnt light enough yet but getting closer to tint of sky line

48

8:37 - perfectly clear sky
 Above - ~~the~~ clouds along
 sky line -



8:45 am

I fear as we recede from #10
 at present slope of light reflected
 from it it may get darker
 because when I approach it
 gets darker - & stands out
 the stronger against
 sky

49

I think on cloudy overcast
 light clouds overhead enough
 light will reflect back on
 #10 to do the business
 by 7 to 7:30 am but at
 9 am not enough light reflects
 back to be as bright as
 sky line -

9:20 - #10 too dark yet
 not satisfactory -

On the bridge = not a single
 board has the tint of sea
 back ground, #10 too light
 1 too black & none fit.

Lower down sitting on
 stern 6 has a resemblance

one thing is sure. Seals
 will have to come to surface

50
3 pm on sun side to get 16 ft
or run periscope way up
as short periscope will
be no use inside
outside 2 or 3 miles -

10 am - now 8 9 & 10 show
OK by augmenting light
fleece clouds overhead
not many but it serves
to light up 8 9 & 10
Think this is entirely
due to these clouds
reflecting back & of
there was no clouds I
would be still
unsatisfactory for want
of light - $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$

51
8 & 9 are striped
8 was striped at 8 to
830 - #10 is being striped

10-17 AM - With straggling fleecy
cloud above the 8s 9 & 10 are
now OK & well perceptibly disappear
in 3 or 4 miles -

Can nearly wipe them out by
augmenting showing they are
get lots of reflected light

Settling down -

10 42 am - 8 is least visible
by augmenting fleecy clouds
overhead clouds
see very faintly appear 8 9 & 10

According to this
if fleecy clouds overhead
shutter will take care
of camouflage from
10 am till dark -

5½ hours it fails 8 hours OK 52

If no clouds overhead it
will not start much of
any before 11:20 am -
7 hours it will fail
+ 6½ hours OK

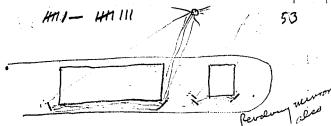
Evidently some reflecting
device must be devised
to get on other side of
boat in shadow

1050 7 is most visible
by squint -

1117 am 6 is most visible

HM1 - HM111

53



This may not be affected by
Refining + 6x8 mirrors there was
a streak 20 ft long along
cabin very bright

Think 2 @ 2½ width of strips is
widest shadow we could
be better making better tint
close to with glass + also
making measurement of shadow
better in fact 1 inch would
be OK if construction OK -
10 tons would be movement
of 1/10 of inch - each time -

1130 - 6 best, sun under
cloud can look at sun

54

1957 - actually - 1207.

6 best - sun under fleecy cloud

1220 pm 5 is best
sun under fleecy cloud best
sky very bright, soft1245 pm 4 is best,
getting hazier in the west at
Honojo - light fleecy clouds
blue & white spots small
overhead.In nearly every case
2 numbers except to
Exochorda are OK one being
slightly better than the other
showing range of 20%.

55

19th

1250 1003 best, 2nd -1250 1/2 pm now 1005 6th -
Rips in sky

As the only light is white
with clouds & very light
blue - perhaps all the
whites should have some
slight color, (what kind)
to match blue of sky line.
as I now see the sky is
BLUE behind boards
all along East so

so we have to contend with
bluish sky line under some
conditions, not sky blue but tinge
of bluish =

110 pm - 7 best ^{sun} ~~sky~~ went
under thick cloud. now comes

out a 4 is best - 55⁵⁶

If any this is to be used
it probably should be
in very white streak or
separate - $\frac{1}{16}$ or less wide
on slitter it could be
on 2" white about 10 strips
 $\frac{1}{4}$ wide - perhaps the blue
should be in the black & also white
for bright & dull light.

120 ftm Very Hazy West
Very Clear East

For Rfpts in sky all
shutters should be
Controlled Electrically
so change be made
in 2 seconds

19th

57

1.42 pm # 2 best 3 second best

146 ftm standing on
pilot house & viewing
boards against sea
as background No 1 is
best No 2 2nd best.

Know think skyline at all
times has a tinge of blue
although it looks white
or dirty white -

& This must be
provided for -

2 17 pm # 2 best 1st 2nd best.

2 18 2 best 1 2nd best.

{ sun clear clouds -
95% probably not heavy

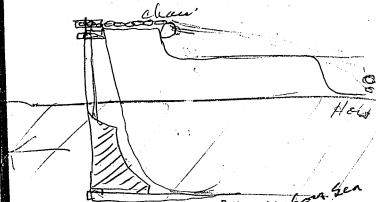
Think 50 50 should have a
thin streak of blue in each
+ then - same in white + black
Keeping $\frac{1}{2}$ of white plus blue +
black plus blue same -

When squinting + 2 is best
there is a dirty black or
brown which if there was a
thin blue streak would
correct it + give it the
bluish cast of the sky line -

no clouds covered
no 2 best - 2:55 pm

East is no clouding up, slight bluish
west hazy - apparently
no clouds covered

Bow Reelers



standing on Pilot House top 19 ft above sea
only fleecy clouds - little haze

Sachem left fort for Greenport
at 4:18 - 4:18 $\frac{1}{2}$ full sun
Boards on ~~the~~ sea background
no 1 best for this -

water line 3 ft above top of
board +

4:30 top of boards just
top or edge of sky line no 2 best

60
442 No 2 gone & 1 weak
band still visible &
think some of water
line -

447 Can just see
band 1 & 2 in slight
gap wholly in sky line

450 - No 1 & 2 easy to see
No 3 almost gone.

451 1 & 2 gone -

455 3 & 1 & 2 gone
boards all above
horizon 4.57 -

61
5 pm 4 gone -
still above horizon

~~501 5 gone~~

504 5 gone -

505 6 "

506 7 " 9.71 knots

507 9 " 11.17 knots

510 all gone within
5 1/2 minutes

looks as fall
was above sky line & lost
out by want of light -
& not due to redundancy of
the earth. —

Hanford sitting at table
on Sachem ^{near deck} - using Eye only
Read it - his watch is
10 min faster -

Started 4:30 - $\frac{4:51}{4:19}$
32

4:40 2 very faint
4:45 2 gone - 3 2nd best
4:48 3 gone 1 "
4:53 1 gone 4 "
4:59 4 " 5 "
5:00 5 "
5:01 1 in flight again ref 3 gone
5:03 1 gone
5:08 6 gone
5:10 7 "
5:18 8
5:19 9
5:20 all gone

Note not much difference
between 19 ft high ^{on}
bridge + Hanford ^{on} 19 ft high
on deck - "

It seems to be a question
of flight - + not definitely
of height in this case

Sachem went 1134 ft
per min - $\frac{1134}{32}$

$\frac{2268}{3402}$ (6.87)
5200) $\frac{36288}{31680}$
 $\frac{46080}{42240}$
384

1243 went in
6.87 miles

64

Phenomenon



~~When sun is in west~~
~~over top 12 noon~~

East always looks
 Clear no haze
 but West always
 Hazy

Knot $1\frac{1}{2}$ land miles
 6080 ft in Knot

65

No 4 went at 8.8 miles
 5 9.85 "

Left Grampart 1145 (dock)
 probably - 1150 full apes -
 Pilot House first saw
 white boards 1223 -

1238 - all visible except.
 No 3 - at 1239 -

No 3 faintly visible -

The haze is very strong
 today. Clouds all
 around horizon - blue
 sky overhead no clouds

in certain directions
 haze almost as thick as
 a fog. First seen 6.87 -
 No 3. first seen 3.57

66

HCl anhydrous at 10 Centigrade
is liquid at 40 atmospheres
Spec of 1.27

1 at HCl Combusts 3
atoms H_2O -

HCl liquid anhyd does not
attack Mg Zn or Fe

with can liquid Ammonia

Raw gun can fire

Wt 4 + 2000 gun

HCl both gases fog
when by diffusion

by wind with gun

Wt 4 fog -

on balls can be fired
from one projectile -

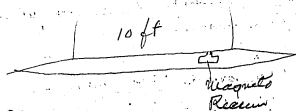
or 2 times in 1 ⁶⁷
projectile -

I note sun shining
on board ~~that~~
sky line between
increases in depth of
blue tint,

as sun gets lower 4 pm
visibility shifts from
#2 to #3.

Its probable no 2
white should be tinted
light blue the tint of
blue increasing as sun
gets lower (10) lowest 3, 4, 5.

68



Rumukun says water
 Carved along sides of a
 boat 10% worse still
 10ft is enough smooth sides
 probably to do the job &
 water at lake goes with
 the float & gives no noise



69

H_2O absorbs $\frac{1}{2}$ its weight of
 Ammonia -

Chloride Ammonia

Volatilizes by heat without
 melting -

Hydrochloride of hydroxylamine

Melts 100 Cent -

Then decomposes with

Violent evolution of gas

into NH_4Cl , H_2O & NH_4Cl

its Oxy sol in alcohol

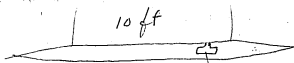
Specif NH_4 0.76 condenses

to liquid at 50 Cent -

~~freezes~~ at $0^\circ C$ 4 atmos

$28^\circ C$ 10 atmos

68



Resin
Resin

Runkin says water
Carried along sides of a
boat 10% waste still
10ft is enough smooth sides
probably to do the job &
water at hole goes with
the float & gives no noise



69

H_2O absorbs $\frac{1}{2}$ its weight of
Ammonia -

Chloride Ammonia

Volatilizes by heat without
Melting -

Hydrochloride of Hydroxylamine

Melts 100 Cent -

Then decomposes with
Violent evolution of gas
into N , HCl , H_2O & NH_4Cl
to form salt in alcohol

Specific NH_4 0.76 condenses
to liquid at 50 Cent -

~~Freezes~~ at $9^\circ C$ 4 atmos
28° 10 atmos

Experiments Lyle gun Sept 19/17 70

No	Alt	Elevation	Charge	Wt	Range	Wt	Wt	Wt
10	L	42'	3	oz	18	385	111	4.4
2	L	41-30"	4	oz	18	884	19	7
3	L	44	5	oz	18	175	235	10.2
4	L	35-30"	5	oz	18	1211	203	7.3
5	L	35-30"	5	oz	18	806	166	6
6	L	25"	5	oz	18	440	136	3.9
7	L	15-30"	5	oz	18	490	175	2.9
8	L	41-30"	7	oz	18	3880	355	15.0
9	L	42-30"	8	oz	18			

L Series projectile cast iron solid
used 3 ft of one inch rope for a
tail, shot tail first, it turned & went
straight

Large Reg Lyle gun black powder in
cloth bags ignited by friction primer

A series	Alt	Charge	Wt	Wt	Wt	Wt
10 A	42 30	2 oz	946	240	88	3.7
11 A	42 30	3	9	510	129	5.4
12 A	41 30	4	9	530	131	5.4
13 A	41 30	6	9	1550	224	9.2

Shelby tubing 19' long plugged both ends & filled
with sand 3 ft rope tail -

71

B series	Alt	Charge	Wt	Wt	Wt	Wt
14 B	42 30	5 oz	9	945	175	7.3
15 B	43	7	9	880	169	7.1
16 B	32	8	9	700	156	5.1

B made of Shelby tubing 18" long
plugged both ends & filled with
sand - NO ROPE USED

Remarks

- 1 Projectile tumbled slightly
- 2 " " " " " " " " " " " "
- 3 4 & 5 " no tumbling hit on end
- 6 & 7 little tumbling hit on end
- 8 unable to find projectile but
observed time of flight & calculated
range - Rope broken off in flight
- 9 unable to find or follow it in flight

- 10 & 11 Tumbled
- 12 " slightly
- 13 no tumbling hit on end
- 14 Tumbled
- 15 observed time of flight 7.5 sec
- 16 little tumbling

21st - Sleds 2000 ft away⁴

4 50 am - aurora - 20 ft above boards - from board up to 20 ft it is blue to horizon, water showing faint reflections from ~~light~~ light from Aurora -

Can see 10 a little brighter than No 1

A+B yellow pine just as black as the others

I now can see to write,

Clouds all around horizon, apparently clear overhead

5 AM 22 Amp. scarv light thrown on boards - 1 foot. Can see light on every board. 8, 9 + 10. Very bright white. Covers circle 38 ft diam.

Now quite light on ship. good light even in good shadow from cabin which comes from the Western sky, by reflection

No arc light now.

No 10 shows whiter than No 1

B with eye shows yellow. A don't see the angle probably

As it gets lighter tried arc light again. Just 5 20 AM - light from arc only just perceptible apparently. Sky line ^{is} brighter than the reflected light from West side. That say 10 gets

No 3. Blued white part same black as 1 + 2

Both A+B very yellow & distinctive from 8, 9 + 10 which look whitish -

Sky line East being so bright # 10 is in sharp silhouette & darkish - it needs light but don't get it from the West enough by reflection -

Awoca up his nose & nearly
grows, sky line at boards
bluish white -

There may be some show for
Incandescent foot lights in early
morning but none later.
Even arc is doubtful, but
possibly ~~on~~ a 12 deep light for
Every 100 or 200 sq. feet arranged
side course or so foot light might
do, but when sun gets high will need mirror

5:30 am Sun up one diameter
& scarcely visible

9+10 Very white but sky line
is as much brighter that its in
dark silhouette bluish casts
to sky line. 10 wants light
to bring out of silhouette -

Slightest squint bluish. 10
but how are difference between
1 + 10



No doubt that for shadow side paces
white paint is best and early it must
be illuminated & later strongly illuminated
& still better probably with mirrors
will do any good, if at all

6 am Cant see Plum island on account
of haze - West sky all bluish & hazy

Can just see land on right side
with naked eye but not with
glasses. Land nearest sun & near
us probably 2 @ 3 miles -

The sky is so bright now in

78

The East that even 10 only shows a hint of white. A+B black with faint yellow tint.

6 30 am

thick haze

hazy

hazy

Everything in haze zone which to one looking West is more than $\frac{1}{2}$ the horizon could see very little.

Even the 2 groups 600 yds. away look hazy - 6 30 am can't see Plum Island

Strong silhouette ~~group~~ is due to want of light & not else.

* probably reflection from my face & everything on boat

79

The little test boards on each side if held up in shadow show fine rare nearly same as sky line (15) the white & 3 or 4 blue tints therefrom.

* Illuminated entirely by reflected light but the moment I make them in deeper shadows by covering with the hand they show dark silhouettes against sky line.

9 am all boards still in silhouette but not so sharp 10 is somewhat better than No 1

9 48 am - The fresh painted A+B with lead paint & just finished now show up next to No 1 very distinctly white & is only slightly in silhouette slight fleecy clouds East to overhead blue from there west, Apparently a strong illumination would make it ok by day or moon

80

10 am can ~~be~~ nearly squint out A+B
painted white (damp) ...

Plum Island a land on south
Easily seen but lots haze still

1024 - A+B pure white at present
Can nearly be squinted out, a. is now
Very Valuable -
If could get a better white thick
with fleecy sky 10 am it would be OK
leaving only 5 1/2 hours
dangerous time, just even
that as early haze will help

There is a decided gain between B (painted)
+ the 95% white of #10.

1040. B can now be entirely
squinted out. A is being painted again
on account of the angle which
is favorable. This seems
easier than if it was at
dead right angles to sun
fleecey cloud all overhead
with bluish spots. -

81

Note - white light produced by
mixture of green + red - orange + blue
yellow + violet,
see Watts, Light p 649

I note Wm glass that B is
not a dead white that it
spatters & probably showed less
3 coats to fully cover the yellow
then it would squint out
1/2 hour earlier -

1050 #10 Cant be entirely
squinted out yet. although
B. is practically gone without
squint.

1106 am I think I notice a
change. B is getting whiter than
10 - A is still OK for
unsurprisingly probably due to angle

1110 AM 10 is better than B
B getting too white. A best yet.
1114 No 8 + A best.

Everything changes rapidly
now as sun approaches meridian
& quick adjustments will
have to be made, every 2 or 4
minutes.

1117 - # 8 best now. A getting white.

The large angle of boards to
sun don't seem to make very
much difference in time of change
only question apparently of
a few minutes.

1121 - # 7 is the best.

1136 6 "

1149 5 "

12 noon 4 or 5 best - 5 too light 4 too dark
but good -

1220 - 4 is the best

1226 4 " "

1.16 3 best, then too white

1.45 ~~6.45~~

When 80% white - black
is ok 80% white - Ultramarine
is perfect.

1.57 - No 9 best.

Sun is greatly obscured by
clouds its light is getting
dark in the West - Very bright
just see plum kind but faint -
B has been too dark when
seen was bright (10) sail
fairly bright seen at
no time today has been
real bright - The

Sun is so obscured by
white clouds can't find out
where it is at 210
but day is bright it would
be called Moderately
(Cloudy NO 6 is)
best at 210.

A is now finished & at
210 pm looks Violet.

Watch 9 min slow by Hanford
at 210 pm

My impression is that
the shade of Ultramarine
should be 2 shades
deeper & probably Cobalt
Blue is proper blue

In any event blue for darkening is
better than black as this is
first case where skyline &
board was perfect.
While painting the white
board starting at one end
the board kept absolutely
diminishing in size so
perfect it was probably
having the right light for
80% stripes.

Perhaps for winter present
Ultramarine tint is deep
enough as the darker
winter - I'm assuming
a deeper shade could
be used

NO 4 is slightly lighter than
A at 220 pm - but in black
NO 3 was almost on white so can't

Compare

2.22 A to 10 best,

A + 1 2 3 + 4 look black best
A still has a bluish tinge
Very needed by glass.

2.41 pm 5 is best.

4 + B look alike in shade

1 2 + 3 very black A
Can nearly be squinted
out

2.43 Sun now shows 1 2 3
dark + A nearly squints out

2.45 - 3 squints out better than
A A going to Ruddy violet,
+ Skyline getting very blue

2.47 3 + B best A prominent color
possibly Ultramarine not
deep enough for strong light
Sun can be seen + covered
thin clouds

One Curved has above
Hull on one side no ends -
25.95 ft + the other 16.00
sq ft to be Camouflaged
43 sections 6 X 10, + 27
for the other -
See how much ends take

4.12 pm I guess Ultramarine
is too light but
not sure till I get
90 + 95% cover

85
A is either painted lead or last
part not dry. last part 2 or 3
shades deeper color

No 10 is now 90% white
10% Ultramarine blue

B is Dead white, (lead)

Sun Yellow 445 pm -

No 5 is yellow A Ultramarine
80% is violet in shade to
tinge red -

Have noticed right along
towards sundown dark
best is yellowish tinge
yet sky line is pretty
dark blue -

Lead must do something 89
Try Aluminum & Metal
violet paint -

5 pm - A violet 1, very black
2 black 3 dark 4 dark yellow
5 very yellow 6 large yellow
7 8 9 + 10 - less yellow -

B near white is white -
started for program part
504 pm - 5 least
visible, ^{+ yellowish} sun yellow red
only seen 11000 by
Eye 2 -

5 10 6 gone
5 11 5 1
5 13 $\frac{1}{2}$ 7 4
5 14 4 1
5 16 - only 9 10 + 11 visible

Dock still visible -

5.17 - 9 gone

Nine spots can be seen with glasses

A 1 2 + 3 miff 14567

8 9 10 + 11 or B

All gone with Eys

Now glasses -

5.21 - 142 visible faint
10 + 11

Changes as sun changes -
Dock visible

5.23 only 11 or B visible
now when 12 flash up

5.25 11 only visible &
Dock gone

spelling dark
Can't say if sun down
but think not -

5.26 - only an occasional
flash of 11 - as know
Exact position to look
for it at Edge of foot, which
can entirely be seen but
hazy

5.31 foot gone with glasses
just see it with Eys -

5.32 foot gone -

For 1st time in my life I notice
 8 pm 2 hours after sun down
~~that the~~ now dark
 except $\frac{1}{3}$ moon 2 hours
 up that the whole
 sky in every direction is
 a deep shade of ~~the~~ BLUE
 I have already previously
 thought it simply
 dark & without color
 but its really BLUE.

Went on Rampant, started Engine
 full speed 225 about Rev per
 Min - with teeth got
 112 main sounds of half
 of the Revolution. Cant say
 why should get only $\frac{1}{2}$
 of as 4 Cylinder.

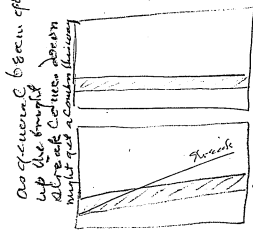
Also a continuous grinding
 sound like grass mowing
 together, also unperiodic
 individual sounds

of very great change in volume
 With Ear only heard Engine
 a little -

But the whole boat
 janned badly - & janned
 every persons body, all the
 ropes came in vibration

With Bell Magnet lay
 on cushion on boat &
 4 stage cushion, the
 noise was terrible but
 I could not recognize
 the periodic noise of
 the engine, Evidently the
 noise was due to the
 Boat jar communicating
 to the Bell Magnets

Notice that the beam from the mirror grows shorter and the angle changes:



about 10 mm to make the change of angle

which is $4\frac{1}{2}$ inches at X

Notice that the bevelled edge of the mirror throws a very brilliant

streak of light many times brighter than the general mirror —

also I notice that the strong reflection of light from the clouds is reflected on the board which viewing end on or at a little angle from board is as strong as the general beam but viewing board in front can't see it why.

Diaphragm jarring & this
was amplified also it
got air waves —

Jerry took diaphragm out.

The noise was then very
weak but could hear
the engine revolutions
free & clearly from
the noise of air.

There should not have
been any noise but
undoubtedly the wave on
magneto was jarring by
engine & this amplification
gave the engine noise.

He will put diaphragm
back & plug air hole
to see how much
direct air waves
distinct from jar

When Bayou Yacht is towed
there will ~~not be any~~ ^{be} as far
~~noise~~ as far noise
transmitted from the hull
of boat to the water
thence to Magneto & we
will be just as bad off.

possibly if a magneto was
put close to the shaft or thrust
bearing or a diaphragm fastened
to wooden hull & magnets adjusted
close to it, ~~so~~ that the
wave would be generated
in the same circuit & balance
against trial frame. (Bigoumont
either at input or output
coil — by paying out
more or less line the
phases could be brought to
neutralization — as
one would be local & the

98

Corresponding one lag
 $\frac{1}{2}$ a wave's length.

As Engine makes 4 Rev per
 Second the wave in water
 would be probably

1123 ft long - $\frac{1}{2}$ is 561

so line would have to
 be paid out 561 ft
 to neutralize the boat
 around + the volume
 from local magnets
Regulated to be same as
 from Byonboat,

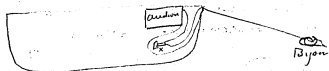
6 20 Am Sunday 23 99
 Clear sky Cumulus clouds in
 places on horizon



Later in day Amended

The whole of the sky except a
 small section A is light blue
 day is fine - shadows are Nat,
 deep plenty of reflected light
 but can see cum clouds except
 on horizon but altho sky appears
 blue + clear there must be
 clouds like those on horizon
 thro invisible -

I notice in path of a boat
 way out where sun shines on
 wake the water looks
 dirty white no blue or
 green at the 6 20 am angle



X is same kind of phase as in Byon in series with Audion + box situated around it -

The pass of boat ends waves into audion ckt while Byon sends same waves into circuit which it gets from boat then the waves -

The line handling Byon is let out till the waves are in opposite phases, the box is adjusted so volume or strength of waves from boat phone is same as Byon phone then there should be

Silence as far as boat sound are concerned - The Byon will then receive any outside sound free of boat sounds

If outside sounds act on hull of boat then it will be necessary to connect it with some place on boat or at Engine where sea waves cannot reach. Norman thinks this will work

Sunday 23 230
Very Clear day. white sky lin Country from grassy point + just passing plain Island light. Norm with Eys No 5 best. one mile away it is barely visible ^{in distance} fleecy clouds in front of sun. There are fleecy clouds around + not self

Karegin - White Caps -
 $\frac{1}{3}$ of boards blown down
 sky blue is here free from
 clouds.

There are rifts in clouds

A - 80% Ultramarine wife says
 is lavender - to me its not
 blue at all but a reddish tinge
 color of indeterminate character
 its color stands out
 clear from the others

5 boards blown down

3 o'clock PM
 No 3 which was a tinge
 of blue in the white. 80% black
 is least conspicuous 1500 ft
 away with full sun light
 fleety clouds in front of sun

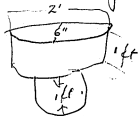
Also the color of 3 has a bluish
 cast & nears sky line color
 than any others - the next
 one No 4 is yellowish white
 &

We should try if we can
 hear a bell from Byron laying
 on boat Engine stopped
 + turn new screwing
 Resonator + then start
 Engine -

A Rape Byron 1000 ft
 long by square of distance
 Aspinning Engine & boat
 sounds are 100% on a
 line 100 ft long then on
 a 1000 ft line it will be
 reduced to $\frac{1}{10}$ or 99 times

104

Merum figures that a $3/8$ " smooth rope-towed between two to 26 kilowatts (then 2500 ft long at 11 knots per hour will have a pull of 189 lbs - and the Rigou



This will have a pull of 49 lbs -

Merum thinks if boat turned Rope strain wouldn't increase more than 15% as it would follow

105

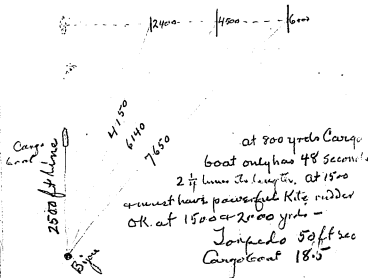
The wake of the ship which is line of least resistance

Pull on rope is directly as to the length,
2400 yards 540 lbs plus
50 lbs for Rigou

Merum says of Rope 2500 ft or more 100% at end of 100 ft line, the noisig at 2500 ft be reduced 16%
800 yards -

Norman figures

106



Sub	2000 yards	Bijou	2420
	1500 "	"	1951
	800 "	"	1341

If strength of signal from Torpedo is assumed to be 100% if heard direct from ship then

2000 yard bottom
1500 " "
800 " "

Ship 100% Bijou 68.3
100% 59.1
100% 35.6

730 am Sept 24 1917

Heavily overclouded all over no sun can be seen but light is excellent being generally diffused all over about the same

The 12 white boards do not look black at all but hazy white at a distance. When Sackem stops at the usual place 1500 to 2000 ft all are white

It is difficult to say
 what is needed to make
 them match the sky line
 but think should be a
 little lighter. It would
 only require No 11 which
 is the whitest to have a
 very small amount of light
 to be squinted out -
 sky line appears white no.
 or a trace of blue extends
 over up several widths of
 the boards.

It is evident from this
 that the more cloudy it
 is all over the more general
 is the lighting ~~the~~ now

of the suns direct rays can
 shine on any object. Hence
 all is diffused light &
 white even in the morning
 is able to almost be out of
 silhouette but would need
 some more lighting but not
 there was thicker clouds.

It is probable the Eastern
 side of the boards would
 be a shade too light &
 would have to be darkened
 although the light seems
 to be even in every direction
 generally diffused

8.25 AM - No 11 is now
 exactly like the sky line
 This is the pure white
 one.

Downy any haze.

110

8:50 am. all disappeared except No 1 & 11. 546 best
don't have to squint all
you can see of the support
sticks. No 11 & 1 are the
white. 12 is against the fort.
The light has increased
so 1 & 11 which is pure
white are more conspicuous
from increased light while
the others only showing
one coat of white over
the previous black stripes
are not pure white.

The sky line has no
tinge of blue as the
probably all clouds

This shows in cloud
whether the shutters
from 8 am is OK
for all day &

111

Light could only be needed
from 4:30 am till
8 am —

9 am Sun is showing (more
faintly) can see where
you sit down but can't see
sun or one of 2 in the
boards not pure white
are invisible.

9:10 am - This would be
considered a fairly light
day. One can see where
Sun is by the clouds
around it being a
little brighter than
those further away
but that's the only
evidence of the sun
(The darkest white)
boards are not becoming
whiter but only ...

takes a slight squint to
make them invisible -

920, Can now see the
sun shining thru clouds
but can't look at it
it appears bright but
it don't hurt eyes
also reflections on water
fairly good

two or 3 of the darker
tent white boards
are easily squinted
out, sky line same
but a color as board
no blue to amount

to anything but slight
bluish-grey. Western
sky line fairly bluish -

The shadow side of a ship
can be managed in the presence
of clouds in the West covering
the sky - The greater the cloud
the earlier in the day will it
Camouflage - In a perfectly
clear sky it's probable that
with all the arc lights that
could be used per se, it
that Camouflage would not
be effective before 10 @ 11 o'clock
Whereas light fleecy clouds
would start it at 9 @ 10
as clouds increased in density
the Camouflage would
start earlier, & with
entirely overcast sky
would probably start
without arc lights around
7 to 8 am - Earlier than that
would have to use arc lights

114

9.40 - ~~sun~~ sun was nearly gone - clouds thickened near it boards can scarcely be seen even without squint -
Hulls has same color as sky line +

9.52. are putting on 2nd coat white paint on all -
Can just see sun (dull)
all boards too white
~~Paint~~ + used lining down

10.35 am all white + all
Camouflaged nicely

115

In any light where white board shows white against the sky line the Boat Black & Camouflaged. If ~~the~~ white board shows dark it must be lighted so that it will show just white against sky line when it could be Camouflaged -

Cargo Boat No 1 of Drawing

Requires 8664 square feet of
Shutters for all sides + ends

of this 4920 ft are for the
2 sides - + 3744 ft for
both ends of Cabins +
Pilot etc - Nothing
allowed for bow or stern
perhaps 500 ft should be
allowed for stern.

Making total 9164 ft
Excluding the Hulls -

116

This makes 18328 square feet
of $\frac{1}{16}$ th thick of steel

44175 lbs of sheet steel
also bars 1" wide $\frac{1}{4}$ thick
61 lbs to each section of 6x10
on 60 sq ft total bar iron

9164 lbs —

Hence 44175^{lbs} sheet steel
9164^{lbs} bar iron
53339 lbs of steel

Amount for foot + holding
brackets not yet figured
+ Control Mechanism

150 lb finished is \$8,000.

117

153 sections Equal to 6x10 high
required

Each section weighs 350 lbs
The movable section
consequently weighs 175 lbs
This will be ok without
Counterbalance if worm is
used in control

The chances are that
double the lbs of steel
will be necessary for
frames 18328 lbs instead
of 9164 lbs — but by
banding edges & braces it
may not be necessary

118

1110 am. now all boards
 very white against sky
 & conspicuous. Can barely
 see where sun is -
 See quite rough a boat
 rolling. Wife in room
 Sea sick - Not Hazy
 Even less than in clear
 weather. Land on
 every side can be seen
 Plum Island clear
 Waves look big but
 appear to be only
 $2\frac{1}{2}$ feet from Crest to
 depression - one was 4 ft

119

I notice fish nets and net pots
 are not carried away
 although the waves are
 big that pass them -
 Weather is the $3/4$ angle view
 on bell buoys but although
 very large waves pound them

A phenomenon I notice
 in the lists that when
 Sachem is unshrouded
 2000 ft away & you
 notice boards & sparrows
 etc. then when you
 start off & sky is bright
 & no great amount of haze
 distance don't seem

to effect it much showing
that in 8 @ 10 miles
the absorption of light is
not striking, the only
thing that makes the
disappear is haze.
Refraction of Earth.
+ Refraction of sea surface
near sea edge of
course some is due to
dispersion of reflected
light over a larger area
as you recede.

12 10 pm =

Cannot find the
sun - but plenty of
light - Boards
with 2 coats all
very white -

scarcely any haze. Plum
Island & land on right
clear only very distant
land show a little
haze - this is not true
when I am out & not
clouded.

at 1 45 pm sky overcast
no sun - but good
light. Boards to eye
absolutely disappeared
in $1\frac{1}{2}$ miles (about) -

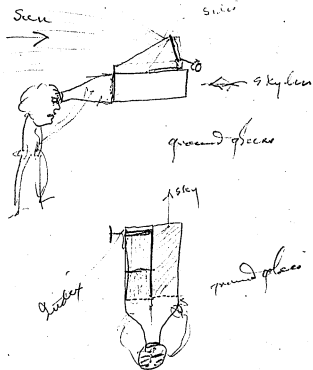
When about $1\frac{1}{2}$ miles away
at 1 45 pm I watch look
till it disappeared with
eye & glasses it disappeared
with glasses before eye

122

at 2:01 pm — Roughly
 4 3/4 miles — Dock about 7 ft not
 less will measure
 Once about 2 miles away
 the sun suddenly went
 back after thinner cloud
 & let more light than
 & boards showed up
 white but quickly
 disappeared then
 shows Central must be
 quick 2 seconds
 Instrument used
 to detect,

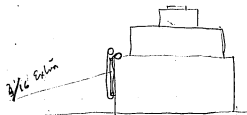
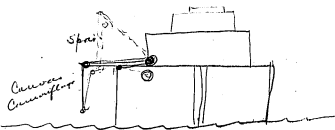
Camoscope — yintoscope

123

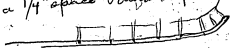


Tintometer

124



The 3/16 extra is fastened to ship permanently - Canvas pieces over outside & go up inside there being a 1/4" space between ship & 3/16



The 3/16 might be even under a shifter -

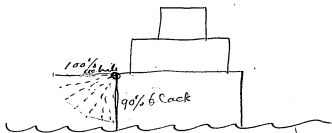
125



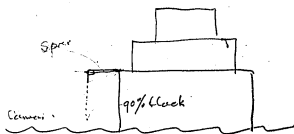
Canvas 1/2 black half white - when all white is wanted - the white side let down when all black is wanted black side let down when 3 ft white & 3 ft black wanted roll is adjusted

Its probably 2 stripes will blend at a distance. The ship 3 ft white together with white & black on canvas may blend

126

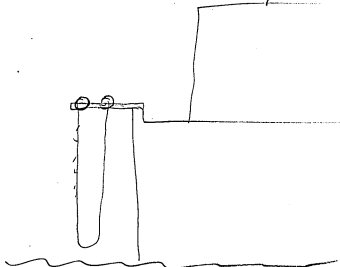


This will probably blend
at a distance.



white Canvas, let it down or
up to increase white + cover
various amount of black.

127



Net, 10 sections 10 ft long finer
+ finer mesh - Boat painted
white, net just black -
out 10 ft from boom -
Winds off one reel on to another
When all white wanted
Ropes net. all wound up

Sept 25 1917

128

7-jc. Heavy clouds on horizon & does
not see many -
At 7:45 just see all the
white boards not yet striped
see them dark against
sky line - just opposite
Orient pt Plum Island &
Highlands

Lighter

Plum Island
Island

~~Very little haze~~

Very little haze

sun

from

7:53 all very black -
Y note if Y look at them on
sun side of boat they are
darker & sharper than if Y
look at them on shade side

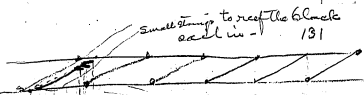
129

Arrived 8:04. 19 minutes,
Roughly 3.6 miles @ $4\frac{1}{2}$
at almost
Anchored 8:07. Boards
all white but too
dark on equator
but brightens as it goes from
1 to 12. This is due to
angle with sun -
Board whose background is
the font from point where
spectrum is so bright white

□ □ □ □ □ □ □ □ □ □
→ 480' ←

130

One part of boat must be tilted
different from the other and
according to position of sun
no matter in which direction
it is viewed by submarine
(figure this out acc. of life)



all the other cloths are
white & hung permanently
on Cables from a Boom
between the Cables is the
spoke upon which the
Cloths are received

Every alternate ~~spoke~~
spoke has the black
cloth provided with
rings by means of
which cords can be
pulled out to cover
the whites entirely or
reefed behind the white
a pulley is at end of every
black cloth spoke for
reefing in -

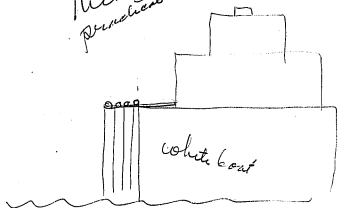
This looks good

132

The only question is will
1 foot strips blend at
3 miles or less. 50.50
and well bottom if canvas
strips get tangled by wind.

133

This seems very
practical.

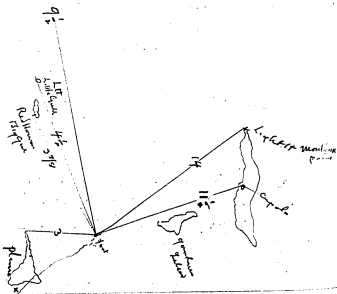


Rope netting jet black
dy mesh of same mesh
 $\frac{1}{8}$ " cord mesh about
mch hale.

~~One~~ seven fadens to mesh
at roll. so each one when fully
lowered, is little lower than the
other a little more side was

sides have. Open house slugs
possible extension for any length
when white miter

134



135-

On P. lat - deck all points at 1120 am
Visible by Eye or glass -

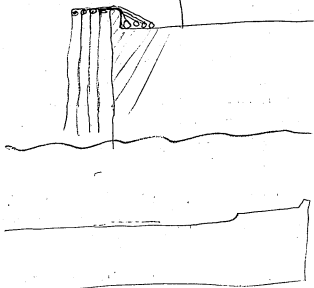
Sept 25 - All 60 birds had
day previous 2 coats best
white lead paint -

WE now paint strips. Using
a shade of Prussian Blue
lightened show it shows
blue + not black. Using
pure white lead to mix the
thick buffer of prussian
blue Painted 8 boards
No 1 is 95% Blue + each
board has 5% less blue
Didn't finish 8th board
till 5 pm.

At 315 slight fleecy cloud
on sun — H₂O 90%
blue best but a little whiter
than sky line
continued next leaf

136

The Captain thinks the Seine
Nets are practicable -



Must look out haout get a
long black line when nets
are up -

137

The salmon is 600 yards away

Don't have the dirty haze of smoke
when you try to squint a net
its more like color of sky
line -

Think the Ultramarine is the
best as must squint with
Prussian Blue when sun was
bright didn't have to squint
with Ultramarine

Inches also No 1 has a tinge of
lavender which was so prominent
with 80% Ultramarine

3:20 PM - No 1 (95%) is best can
squint it out OK

There is no doubt but blue
is better for sky line -
when sun is West.

3 26 PM - Cloud came over sun
+ best was No 6 (70%) blue

3 30 pm Sun out of cloud again
No 1 best, in 2 seconds cloud
came over sun + #6 was best
in 1 sec No 1 best,

3 36 pm Now all are too light
the depth of shade within Blue
[Prussian] is not enough to do
the business on any board
when sun is bright, it would
acquire 97 to 99% blue of this
shade,

Next time must make blue of
deeper shade

It wants a blue, that seems
certain as it approximates the
Regulus better than Carbo.

Also in practice with shell

must adjust for $2\frac{1}{2}\%$ instead of
5% on boards

Note

3 42 PM - Cant see Cupola on Long
Island $11\frac{1}{2}$ miles away haze
due to position of sun in West

3 45 PM - No 1 entirely too white
although before sun passed
midway it was apparently
perfectly black
as there is a clear sun + cant
squint it out or anywhere near
it

6 Boards now striped
Can even see stripes with glass on
#1

3 50 PM - #6 actually
appears white. Even No 1
is whitish

It may be we used too much
white lead to lighten the shade
of the Prussian Blue

that pure Ultramarine or
Cobalt pigments in oil
with a little white lead is
best,

Note a sample of the paint
painted on piece of tin
actually looks green today
when Ultramarine was
painted over a part of it
the Ultra was a fine blue

415 No 1 to 7 too white

417 #1 by agent has a
greenish tint - also it now
reflects light & is not matte
No 2 about,

No 1 is 95% Prussian blue
thinned by white lead paint
so shade should not appear
black.

4.25 PM - All dirty white
+ NG - + cannot be painted
out in the least,

4.37 PM - Only Gardens Landed
Can be seen neither L H 14 miles
or Cupala 11 $\frac{1}{2}$ miles Can be
seen haze thickens as it always
does when sun is on western
horizon - Houses by Temp. Hill
getting hazy (4 miles) -

Something wrong with No 1
it seems to be very unevenly
painted, in addition to green

4.52 PM - White boards
not striped have a yellowish
tint than of Lances

4.55 PM - Big hill haze morning
Can't see windows of big red
house - a white line is
forming at base of houses
the later seen far away

142
5 pm - 3 4 5 6, 7 painted
#1 turns green, looks decidedly
yellow 2+3 just a shade
yellow - ~~8 painted~~
8 Board finished quit for the
day -

507. Sun seems to be about
3/4 hour above horizon + in
the yellow horizon that may
account for the yellow ting.
on boards - sky line in west
yellowish -

512 pm #1 now lost ahead +
appear even whereas 2+3 seem
unevenly painted -

At all times there seems a very
great difference between No 1
+ 2 + the others, ship is
narrow + probably bad painting

525 pm 143
Can't sight anything in the
least
529 Boat started for Home

527	5 best looks red
530	6 "
531	6 "
532	6 "
533	7 + 8 gone
534	1 2 3 4 5 visible
535	" "
537	" "
538	1 2 3 4 5 + 6 visible with glasses

All are considerably above sky
line

540 pm Dock visible, altho tide
up + only 4 ft above water
1 2 + 3 visible

542 pm 1 2 3 vis - 4 gone
also dock The 5 unstriped
white are very conspicuous
Even to Eye

545 - dills

144

546 pm - can see 1 2 + 3
only the 4 white Dock can
still be seen -

547 pm Dock & all gone
Except 4 whites can see
the later even with the Eye
not Hazy
getting dark

550 pm Can see 4 white
boards plain in glass

551 pm whites twinkling

553 all gone

It may be essential to camouflage
between deck houses on Cargo
boat to prevent sub from
seeing any part of boat
against the sea background
if we come close 3 or 4 miles

145

We are now making some
Ultramarine Paint for camouflage
to describe over & on top of the
prussian blue This will make
a decided deeper shade -

We use "11 M" Ultra Shade
made by the Ultramarine Co
38 Park Row N.Y.

We mix with boiled oil & very
little turpentine so as to get a
very deep shade & add a little
drier, its about as deep a
shade & as thick as it will
work practically

We are now going to make
some nets in mesh with
1/8" hemp cord & paint it
black placing 1 to 4
in front of a white board

to tint the hull -

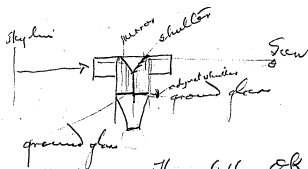
146

The whole Camouflage business is to regulate the light reflected from the ship to distort observers so that the percent of light coming from ship shall be the same as coming from the sky line, then ship will be invisible providing the quality is the same. If 10% is reflected from sky line then the ship should reflect only 10% if it reflects less, the ship will look darker than sky if boat reflects more it will be lighter than sky line -

It will be impossible to attain perfect Camouflage to observers at a distance in certain positions, direct & at angles to ship -

It is probably best to adjust for an observer at right angles to length

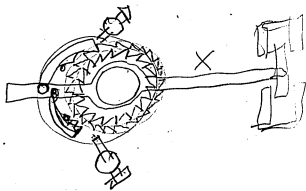
147
of ship as the ship is larger object in this position than any other, observer at a great angle will not get a perfect Camouflage, but there is some compensation in the object as boat appearing shorter on horizon



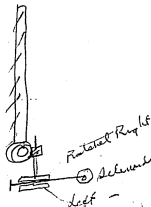
Think this OK

148

When central one click is
out other in when
lever X goes one way.
Click engages & other
Click disengages out
by a pin before
it engages, & vice
versa when X
goes other way

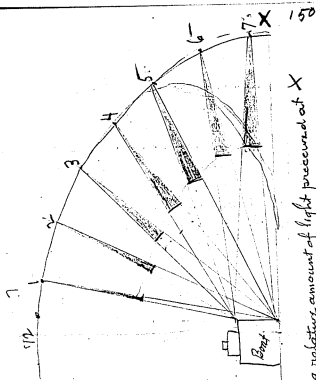


149



When interposed may take
several reciprocations to
advance one tint

Think with bearings 4 ft
apart can have one central
for every 4 sheets 24 ft
if torsion like rod used



Showing relative amount of light preserved at X

Thursday - 27

151

The painting over the Prussian blue stripes with deepest shade of Ultramarine blue did no good it was even whiter on 1, 2 & 3 etc than with blue ^{at the same time}. As no other color is deeper in shade than deep blue nothing except lampblack will do - Since it is impossible to get the blue sky tint this way I am now tinting the white with Ultramarine for 6 boards and Prussian blue for 6 boards each the exception of the other both start at 95% lampblack

Black 95% 90% 85% 80% 75% 70% 65% 60% 55% 50% 45% 40% 35% 30% 25% 20% 15% 10% 5% 0%
 Prussian Blue tint in white Ultramarine tint in white

Striped with lampblack in a little oil - considerable twip - Poor quality of lampblack + not mixed well lumpy

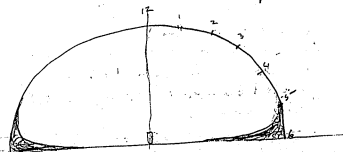
The white tinted with Prussian blue looks green - The white with Ultramarine looks bluish both very faint.

Gray bc it wants a little more
Ultraviolet to match very blue sky line

For some reason the lampblack
looks gray. Even ours look that way
but not so gray as Couch's
I find out best liquid to use to make
them black or rid away with the
gray.

Have sent to Morrison, of
Lump Works to send complete
men down to measure intensity
of sunlight from ~~sun~~ 4:30 and
7:30 pm on Linder

Sept 27



This diagram shows light lost by
absorption in the morning & eve as
shining on a ship -

This if measured for several conditions
in addition to loss from ship by
angle of sun light striking the board
should make a result that
will be valuable -

Instead of putting shutters up
10' high 6' wide its better to put
them up 6' high and many feet long
so strips instead of being horizontal
are up right. The the movable
black strip frames can be provided
with track & wheels & counterbalancing
will not be necessary &
the shutters can be moved
easy from one motor even
if 50 ft long but the frames
must be hinged together so there
is no slack

This gets rid of the shadow
cast by each wing of shutters

154

I noticed when I mixed Ultram blue with the white, that at a certain point a strip painted with pure white appeared as a shade, yellow as against white, tinted with Ultram. The blue like bluing in washing corners, the more things, and I had to use considerable Ultra to get it to show signs of a bluish tinge - I suppose the yellow lenses surprise in the white, was cause of yellow Casts -

Another advantage of having the shutters perpendicular is that the wall not bow but hang a shade, no tendency to bow - On account of the

155

loop like



should be in

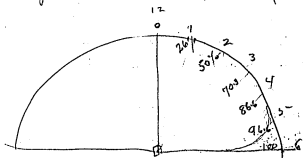
this position for subman ahead - on account of the loop - the end of the black can be painted white (12) 5% as we never need more than 95% black & need 100% white -

28th Sept - Wind from S.W. Rainy & gloomy no shadows at 7.40 am except a faint one! E bright. Light practically even all over

10 am. Cleared up not raining but no sign of shadows rather ~~being~~ bright cloudy day not dark

156

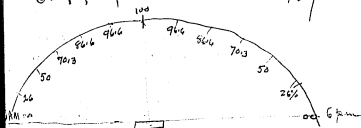
Think in winter when spray freezes
 can cover everything shelter with
 canvas, ~~with~~ using in zone use
 steam pipes behind just enough
 to prevent freezing - 62 CR on
 English Coast, Sept 28



Ship gun North & South -
 Amount of light theoretically
 reflected from ship from observer with
 west,
 N.

Ship going East and West.

157



from Nations gave them with
 light gun I think we can
 fire 3 per minute - probably
 only 1 per minute could be
 necessary - 60 have 180° @
 200 for a fight.



Outside of hull think Canvas
 shutters 3" strips of Canvas
 can be used. with strong mechanical
 device fixed to rail - the blacking

158

on rings & slides in coat by a general
Red & small sub martin -

29 Sept 1917 - Very Calm - no wind
100° + 11° -

Clear day bright sunshiny
few fleecy clouds overhead
Coming from Iracoupa
in morning - All the board

(12) have 3 coats but
white lead paint with
the Blue tint of prussian
blue very very faint on
7 & 9 10 + 12 & blue
tint of Ultramarine on
1 2 3 4 5 + 6 -

All the way to Fort board's
dark, a sort of a hazy
dark - Arrived at

8:20 AM 400 yards
from board which

159

are a light black against a
very bright sky line in the
East - The sky line is white,
probably due to clouds &
haze -

Little & Big Gul & L.H. clearly
Vis by Eye little garden
& forest -

Can't see Cupola or L.H.
+ only a little of land beyond
Garden island can be
seen as seen in two
strong on water reflecting
sun shen on water in
line of vision.

8:30. You can see that board
are white but the sky line is
so very bright they all
look darkish & just
very black -

9.17 - skyline not so bright, boards getting whiter, some fleecy clouds in W. coming - fairly high up boards look darkish white, can't against them semi-white but still in strong silhouette -

9.30 Sky line not so bright, boards now look pretty white heavy clouds around sun - some very thin heavy ones in the west fairly high up. Can't against anything but,

Started striping as described in p. 151 -

Sky cannot be called clear as very light clouds coming over all gradually. Birds occasionally. Boards are showing as white so early - perhaps the slight blue tint is helping. Sky looks in a very faint bluish tint now

10.05 AM - boards look over white but can't against set fleecy clouds -

10.25 Can't against anything yet, sky getting more clouded, sky line still white but not quite so bright as hour ago. There is a very faint voice of blue in it

10.12 now striped, it appears dead black with blue can just faintly make out that it is striped

10.37 AM Can just notice that squinting has an effect,

A Drumport - $7\frac{1}{2}$ to 8 miles off is clearly visible but hull is fair better than dorsum of which there seems several. Sun is full on side towards us - $51^{\circ}3'$ @ $3\frac{1}{2}$ beyond light house on Quill Island

1103 AM Can entirely squint out
8 9 10 + 11 - (12 is shipwreck)
Why 1 2 3 etc cannot be entirely
squinted out is due to roughness
of the boards to direct position
of Sun. Very light clouds
nearly over whole horizon
2 or 3 of the boards could not be
seen without squint of the
side timbers which are not there -
when squinted only these
timbers are seen

We are so close to boards
today that 1 2 3 4 5 + 6
are above sea background
+ 7 8 9 10 11 + 12 just on
edge of sea skyline -

1112 AM - Prussian blue has a
greenish tinge - now the Ultra is
better than Prussian blue
which is getting whiter but I fear
greenish tinge.
So far Ultra is best, I think

also shaded by a trace deeper
blue without harm - as sky
line now has tinge of blue

1125 AM boards all too white
now can't squint out any
but one corner of No 3
is absolutely invisible without
squinting - probably paint
was not stirred enough on
1 + 2 - Think slightly deeper
tint should go in white
on Ultramarine End.

1135 AM - greenish tinge now
disappeared from Prussian
blue boards - 1 + 12
getting lighter shade
boards (white) getting very
white -

164
1155 - skyline at boards
now distinctly blue
so far think Ultramarine
best but there is very little
difference, but still think
shade of blue should be
deeper - so the white in
shade should be distinct
blue & not as now scarcely
detectable - Can determine
best at Laboratory by
looking & looking
against a skyline -

1210 pm - boards very white
1 + 12 banded No 2 partly
1 + 12 getting lighter shade
grayish black - No 2
shade lighter as far as
unmixed light blue
clouds less than at 11 pm -

165
1230 pm No 2 shows
signs of squinting out its grayish
No 1 or 12 no signs squinting out
(how little) -

1 AM - light flow of 4 separated
clouds just sky blue
No 2 just shade squinted to -
part of No 4 being shaded or is
almost like skyline

105 pm 7 shows behind center sun -
fairly well - Cupola on LH on main
land beyond garden (which) cloud
to are only light haze -
quite bluish sky line in north
whiter in south - sun not
bright cloud over it, low
striped back black

116 pm - Corner of No 4 striped
entirely squinted out (seen out from
under ship) -

Now get reflections on water
from white boards -
Haze strong in West & generally
a present calm undisturbed day

2:30 pm No 4 almost color skyline
only partly painted - at one time
across as if boards cut away without
equant, 11+12 now striped + 14 2
4 partly -

2:45 pm No 2 + 11 almost squintable
but No 2 best,

3:12 pm No 3 is best 10 second best
fleshy clouds over sun -
wind now from west, sea yellow
Choppy 6" waves

3:35 No 4 is best, Easler
sky line very blue

Boards that are good have
got the right tint it is a dirty
blue. Combination ⑩ not
real blue but may want
more Ultramarine which
would be bad for the morning
use less - 4 the lamp blue
should be bluer not
gray - but they are very close

When one is right for the sun -
So far Ultra 11 best (10 more close
to boards today than my previous
second as stripes are clump
clean with the planes

4:05 pm 3 is best but it has
a yellow tint against blue line
of sky line. Think want
more Ultra in white or lamp
black got mottle + black tint
gray and it is -

4:25 pm 2 + 11 best, 2 sets -

4:40 5 the best,
red tint in water sky
on some of the boards
light yellow clumps + clouds
Ultramarine -

6 + 7 not stripped best
going for Card to Board

168

left 505 - 6 birds all
dark -

515 - The 1 4 white
no white seen with glasses
& 5 is least visible

The corresponding one on
persimmon side is nearly
as good

520 pm Cont see NO 54-8
gone with glasses -

NO 5 - which was not fully
presented so least visible

647 are still white

Not striped had they been
striped they would have
disappeared before 548

3.1 miles its exactly
bright daylight yet

169

What surprises is the tendency
to see the white squares on
NO 4 considering their size
It may be our eyes
can not much longer

Oxychloride of Bismuth is
known as "Pearl White" for paint

Sunday 30 Sept

Notice at 515 going from London
to Grouppont that there were clouds
on the white horizon & that
the sky above a dark cloud
bank on sky line was light
redish all around the horizon
Sun set no rays black background
on sun big rain storm coming
from West, lightning -

Sept 30th

170

Percent to date of progress of
Experimental part:

	Percent finished
Camouflage.	80
Smoke bomb 3" gun	80
Periscope sighting	75
Lyle gun smoke bomb	50 60%
Rite Rudder	50
Fake Steamer smoke buoy	60
Torpedo detector still -	90% Britishers get
" " Moving	40 50%
Submarine detector	00
Under Water projectile gun	50
Anthracite Coal in D Zone	100
Cutting Masts & stacks	100

Oct 1st 1917 -

Morrison men at 9 am measured the
sky line between boards
gave 432 candle power or
lumens per square foot.

By Eye dead white, no 6
is dark clouds in sky on sky

171

line but fairly blue overhead
at 9 am clouds all overhead
where have they gone to
probably there but very
fading so strong as
transparent -

All painted (10 stripes)

1135 am - 6 is very considerably
lighter & more sky line than 7

12 is darker than 1 -

Thick isolated clouds come
over and frequently.

at no time since 1130 could
no 6 be entirely equaled
out - now 1150 am -

Note Morrison's expert
says 6 X 12 board subcoat
facing East Only has
efficiency of reflecting
light of 65%

I think the shutter should be
polished Nickel or tin & the
paint put on it so as to
increase efficiency for
reflecting light.
We should get 80% efficiency
which will help very
much in the shadow side

12 noon sun free of clouds
No 6 nearly squintable out
7 not so close -

Note = heard Dreadnaught
guns probably 10 @ 12
miles away shooting at
target the 2 shots close
together strong Edison
heard & easy for a
microphone we have

1207 can just squint out
No 6 but with difficulty
7 not so good

Note Vol 11 part 1 Kilmoran p 222 says
in periscope only 20% of the light
reaches the observer

USA standard periscope

length 22 ft Dia 9" @ 6"

depending at head to 2 1/2"

19% of light seen is useful

water in lens then under pressure

12 37 pm No 4 so best but

Can't be squinted out entirely

11 10 pm No 5 best cloud islands

116 4 best.

307 4 best

Don't think tinting with blue
is any good - did better with red
it - 5% is also required
not less than 2 1/2% is
required -
Wants a better white

174

Note = First cloud for h_{1/2}
 given - 45 deg exploded
 too high up - ~~had no hope~~
 35 deg - exploded near water
 but tumbled had no rope

400 ft
 projecting
 600 ft
 breaking
 black powder to grain



900 rec about.

Smoke OK as To sign =

When can stop tumbling
 & get near sea line, it
 will be OK.

3 25 PM 14 East nearly again
 out, still traveled with
 Isolated Clouds

175

It seems that the skyline does not
 vary much in clouds power up to
 3 pm just getting very 10%
 brighter at 3 pm that the earlier
 from clouds variously considered
 from ~~60%~~ 35% white to 80% 20% white

If there were no skyline to
 compare with the shutter
 would be necessary to
 make boat appears neither white or
 black - This it does OK but
 when quality is concerned
 & comparison made with
 sky line which is to make
 the comparison is not
 perfect there is an illusion
 something needed, as when
 nearly disappearing there is
 a haze extremely light
 tint of black smoke which
 is on the verge of disappearing
 it may be due to 5%
 measurement too great

or coat of a blue tinge,

If it needs bluish-tinge it should not be in the white, it might be mixed in the black, but I suspect our white is not good + has some bluish in it or yellow + that when polished nickel or aluminum is used + a good white paint put on this there will be some improvement. Linseed is yellow + dark yellow + some white substitute should be found possibly the Calodiam + some or Silicate Soda or a white resin. Vermiculite W W Flinn etc. Should also be white + Black should be lead black not gray + also with film -

4.20, per No 243 best

Can't entirely equate with that hazy yellowish light

5.25 - Sun just setting -

#6 too dark can't represent it all all -
1 + 12 black - big cloud deep on Western sky line -

5.50, No 6 + 7 represent but
ok - dark - 1 + 12 very
black -

178

4000 ~~and~~ cash side -

$$\begin{array}{r}
 192 \overline{) 8000} - (4161 \\
 \underline{7680} \\
 320 \\
 \underline{392} \\
 1280
 \end{array}$$

$$\begin{array}{r}
 16 \\
 12 \\
 \hline
 32 \\
 16 \\
 \hline
 192
 \end{array}$$

3

$$\begin{array}{r}
 465 \\
 416 \\
 \hline
 279 \\
 1860 \\
 \hline
 19344-
 \end{array}$$

15 Tons

$$\begin{array}{r}
 465 \\
 416 \\
 \hline
 279 \\
 1860 \\
 \hline
 19344-
 \end{array}$$

$$\begin{array}{r}
 465 \\
 416 \\
 \hline
 279 \\
 1860 \\
 \hline
 19344-
 \end{array}$$

66 and

33 H. B. B.

$$\begin{array}{r}
 2 \overline{) 133} \\
 \underline{66}
 \end{array}$$

$$\begin{array}{r}
 60 \overline{) 8000} \\
 \underline{2600} \\
 5400 \\
 \underline{2600} \\
 2800
 \end{array}$$

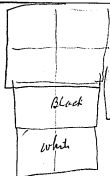
179

180

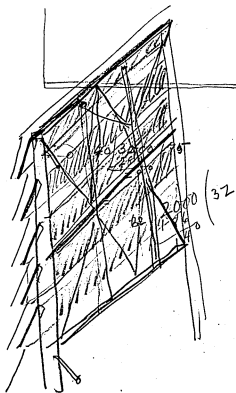
181

$$\begin{array}{r}
 1134 \\
 41 \\
 \hline
 1134 \\
 4536 \\
 \hline
 5280 \overline{) 46490} \quad (88 \\
 \underline{4224} \\
 42590
 \end{array}$$

$$\begin{array}{r}
 1134 \\
 26 \\
 \hline
 6804 \\
 4536 \\
 \hline
 52160 \\
 47520 \\
 \hline
 46440 \\
 \underline{4200} \\
 44440
 \end{array}$$



184



185



11

96 95 94 93 92 91 90 89 88 87 86 85 84 83 82 81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

192

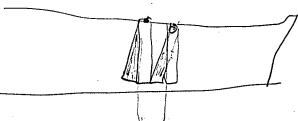
Whitton Stephen



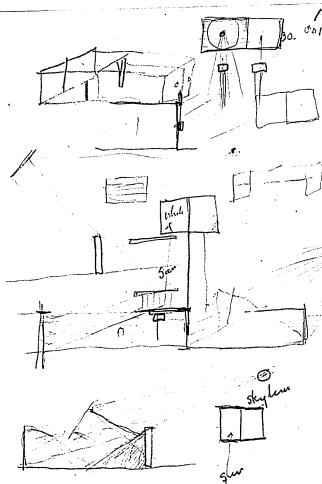
glass floor



black

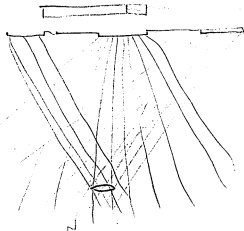


193



No. 407

600 —
200
400
800

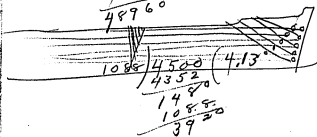
$$\begin{array}{r} 100 \\ 25 \overline{) 6.25} \\ 1.562 \end{array}$$


196

$$60 \overline{) 250} - (4. \text{ sec})$$



$$\begin{array}{r} 1088 \\ 43 \\ \hline 5440 \\ 4352 \\ \hline 48960 \end{array}$$

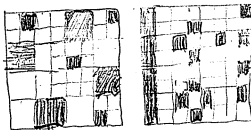
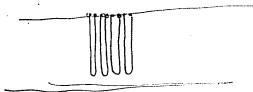


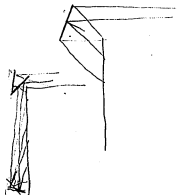
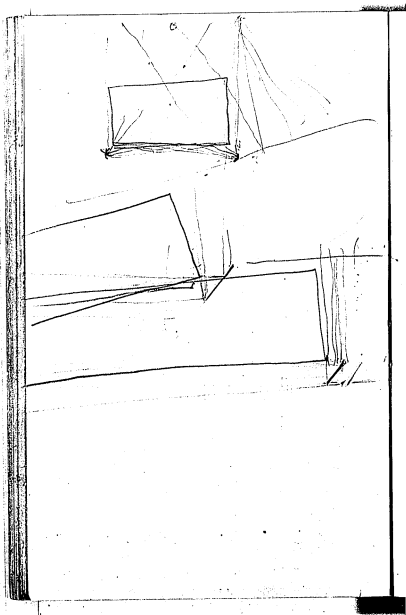
$$\begin{array}{r} 1088 \overline{) 4560} (4.13 \\ 4352 \\ \hline 1480 \\ 1088 \\ \hline 3920 \end{array}$$

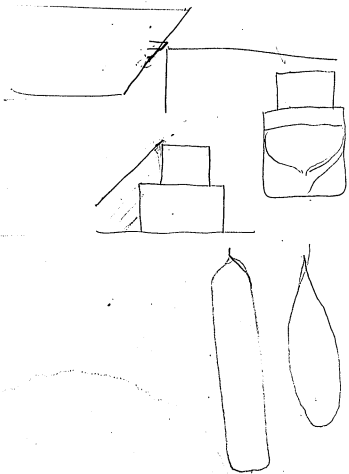
$$\begin{array}{r} 4 \overline{) 1088} \text{ ft} \\ 272 \\ \hline 413 \\ 6 \\ \hline 81 \\ 272 \\ \hline 1088 \\ \hline 1123.38 \end{array}$$

$$\begin{array}{r} 2 \overline{) 1123} \text{ ft} \\ 561 \end{array}$$

197







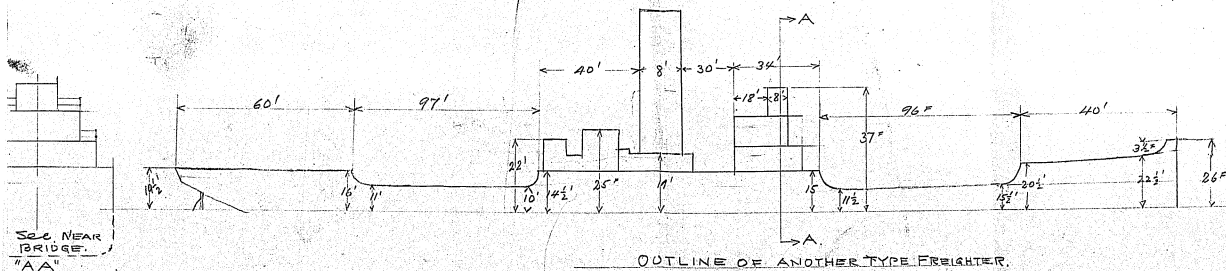
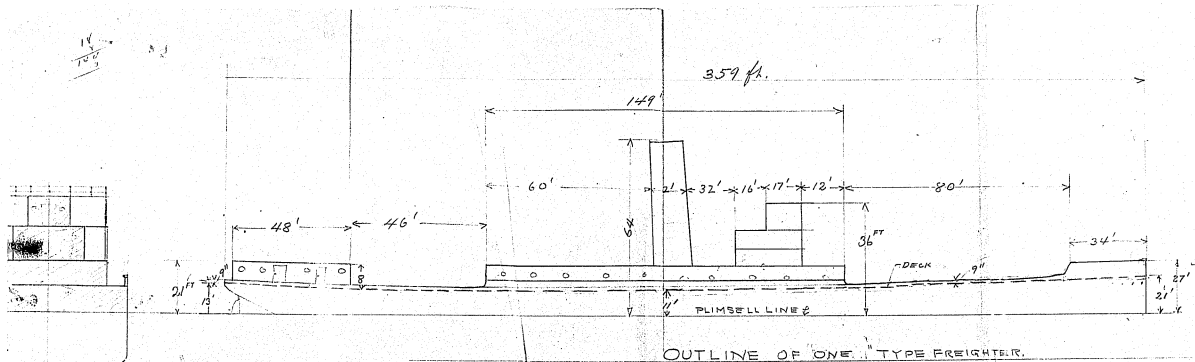
4.30 - Rosey - East
 & starry - all black

Can see that No
 89 is not so black
 as No 1

Rosey extends fairly to plum
 island, & land on left

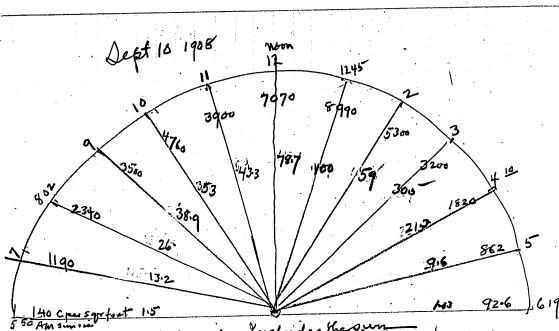


[ITEMS(S) FOUND IN BOOK]



**Notebook Series -- Notebooks by Edison
Notebook, N-08-09-10.2**

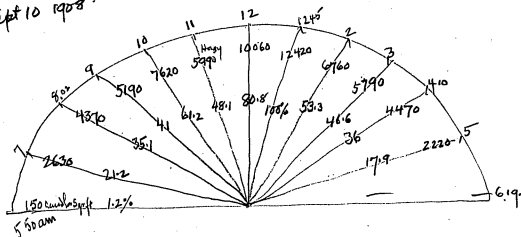
This notebook is a continuation of N-17-09-15. It was used by Edison aboard the USS *Sachem* in October 1917 in connection with his work for the U.S. Navy during World War I. The entries relate to visibility at sea and to camouflage experiments conducted under various light and weather conditions. These include experiments with ships camouflaged by different means, as well as experiments with painted boards of different shades erected on shore and viewed from Long Island Sound. There are also entries pertaining to a kite rudder and to smoke bombs. At the beginning of the book are two pages of data from September 1908 on daylight illumination, which were apparently copied from a published source. Edison's notes indicate that the *Sachem* cruised among Gardiners, Plum, and other islands, using Greenport, Long Island, as a base of operations. The front cover is marked "No 3." The pages are unnumbered. Approximately 30 pages have been used.



Daylight Illuminance on a surface lying horizontal.

Maximum Illumination obtainable from the sun - Illumination
obtained on a surface directly facing the sun at all times

Sept 10 1908.



A gun sighting telescope
only lets 32.5% of the
light thru.

In periscopes (modern) has
so many optical elements that
only 19% of the light reaches
the eye of the observer.

Periscopes have low magnification

The principle involved is like
taking a telescope bring image
to eye piece the add another
telescope with eye piece to first eye
piece. This enlarges in effect
would you condense a then
enlarge.

I looked thru the big end of
Opera glass at boards
which were fairly visible
direct a couldn't see them
therefore if the eye piece was
put to the eye piece - 6

a second opera glass it would
make it worse. Hence
~~Some~~ periscopes are poor
propositions for seeing objects
at a distance.

There is another bad thing
about a periscope
There is a loss of brilliancy
& contrast in the image which is
quite appreciable.

The Cause for this is light which
has undergone 2 to 4 reflections
from the glass surfaces.

The light reflected from the (first)
surface of the first lens will
return again from the same
surface. It comes, but in doing
so it will strike the first surface
of the lens & some of it will be
again reflected toward the
observer. Similarly light
reflected back from the first
surface of screen number 2
will hit the back of objective
no 1 & part of it will be sent

to the observer while the
remains will impinge on the
front surface of Objective No 1.
A part of that will be
reflected to the observer's eye
and on all other the system.

Now all this reflected light
don't contribute anything to
the brightness of the picture
for it don't come to focus at
the farthest point it has its
own focal points & is out
of focus at the place where
the true image lies.
It therefore forms a veil of
stray light over the picture
which detracts from its
brilliance.

I think now I have the explanation
of the Camouflage it is this -

The sky line has a certain
diminution, it don't appear to
vary much during good light
all day -

Now White boards & blackboards
will look black & white even if
there was no sky line to
compare with,

Assuming the sky line
radiate a constant quantity
of light during the day.
all that is necessary is to
regulate the shutters that
the same shall radiate only
the same amount of light
as the sky line to do this
it requires that the shutter
must go from 100% white to
95% black to take care

after excess light reflected
from the sample ~~out~~ above
the light due to the sky-line

If the lumens per foot of
sky-line is say 400 then
shutter must be kept at
400, notwithstanding the
amount of
excess light impinging on
the shutter.

Oct 1 1917

Rough Measurements made
today by photometer

Measuring the lumens or
candle power per square foot
of the Eastern sky line, just
above the water, angle 3 deg
gives following

angle	Reading	percentage
9 40	381	12
10 05	405	13
11 00	342	11
11 30	365	12
12 noon	342	11
12 45 PM	284	9
1 20 "	277	9
2 20 "	277	9
3 15 "	317	10
3 45 "	295	9.7
4 05 "	243	8
4 45 "	169	5.6
5 15 "	50.5	1.7

Exposure 50.5 308 300

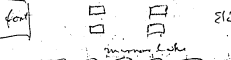
It looks from this that utilizing
 1.7% of the light of sun by the
 2 mirrors at edge or on edge of
 top that with assistance of clouds
 & even without clouds but means
 that it will do the business
 in any event nearly do it
 Only about 175 to 200 Candies
 per sq ft will be necessary
 as there is considerable
 reflection from sky
 Certainly 200 ards will do
 it if 30 amps will do it,

Oct 22 1917

Sadham anchored in line with
 fort but off Orient point
 Penn Island Light house
 4 ^{miles} miles from fort

Oct 7 45am Clear atmosphere
 in every part, scarcely a trace
 of haze even with very distinct
 land. Fort stands, up in air
 + double by reflection. The 2 gulls
 island part below horizon
 stands in air, till boards have
 disappeared. The above observations
 are from standing on deck

There must be some remarkable
 reason for disappearance of board
 It may be a peculiar layer of
 air above the sea, refraction -
 on the pilot house boards are way
 up ok but double



But down on deck only now &
 then see the boards ~~double~~ single
 not double, they will show up
 faintly then disappear
 & vary continuously showing

But the whole thing is due
to a moving layer of air
near the sea -

Sachem Anchored at Island
Base of Little Gull Light House
invisible. shore line big gull
at houses gone - no haze at
all - Sea quiet 2 or 3" waves
very little wind -

I just tried a mirror on the white
board on sachem & it certainly
gives great promise. The yellow
side exposed direct to sun shows
very much higher illumination of a
stretch the width of the mirror
& beam reaching up full height
of board 6" ft. on white side got
bright streak all way up -

There may be a trouble
in using mirrors due
to pulsing & twinkling

Weather wont effect for if sky shows
no sun boards are ok - only
needed in sunny days -

Oct 2 Sachem Exposed with kite
Ruddies - 1 mile from ~~island~~
all boards absolutely inky black
sky blue & clear all passed no
clouds hardly any haze -

This is the conditions ideal for
very black shadows & we thus
have them

Fishers Island clear but bottom
miraged, Montauk light house
clear seen with naked eye
easy. Water nearly glassy
& in places glassy

I tried the 6" string of 100 mirrors
on the white board 6x12 on
Sachem in shadow - It seem
to do the job brighten up
whole surface very much

It may be, shutter plates could be
nickel matts by pressing on
polished disc, then matts
buffed, try exp

I tried a piece of fine matted tin
foil + white glazed paper -



In shade
X matted foil - when close
to glazed paper so very much
whiter foil dark, had color
but 150 ft away both
looked white. Couldn't
tell junctions at several
ft. think foil would be
whiter as it must reflect
more light,

a Matte mirror also would
spread light some + not

Concentrate, like deep mirror

1050 AM all boards very black

Sachem 700 yds away
sea glassy no wind
Sec. Mountain light houses
faintly with lips sharp
and clear with glasses
extending way up like a
steamers stack 3 miles
away -

A kite rudder is a case where
~~was~~ ^{matter} assembled, goes crazy,
11 12 X06 shows whiteness tint

Shot off left - short hydraulics
400cc shot - gun 45 deg
Exploded top trajectory

It was very white for 4
minutes then got thinner
from increasing wind
Can see it much spread
out 10. minutes afterwards
The strong Conclusions
probably made it effluent
Notice it didn't settle
down but keep up
for whole 10 minutes

12 Noon No 6 white but Can't
be squinted out

No 1 + 12 Dark brown

145 No 9 squints out
No 3 against Garden
Island back grass

No clouds

Sacken at wrong angle
to observe, 210 pm
Note Cupola on Island
bottom 9 + 10 boards -
Sun is so far clouds
Even No 11 Can almost be
squinted out, Sacken
too far away 12342
Same 5 against
Gardens Island back
ground 678 9.10 + 11 too
white this at 210 pm

Just fired another Ly 2
propeller - old thin
tube, two Explosions gone
just as left mouth. Cloud
50 @ 15 ft up. 500 cc
drifted over towards
Fisher Island & part

reach sea line covering
 $\frac{1}{4}$ to $\frac{1}{2}$ m. or so.

good for 8 minutes

still in sight up in
sky line after 12 minutes
probably can be seen
for 20 minutes

grossly extended.

after 13 minutes quite
a section is on sea
line & fairly thick
& actually shows a little
land beyond further & land
which I think is main
land -

~~good for 20 minutes~~

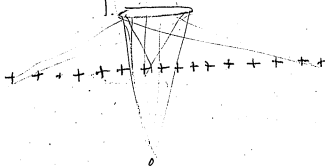
3.15 PM. 2 & 11 can sprint
out 6 & 7 seem pure white

Sky Cloudless -

Goodwin Island almost
as sky line ^{is} on ^{on} background

Don't think submarine

viewing boat



+ sub that it will
make as much difference
as 4 change ⁱⁿ a mile ^{away}
should compensate

355 pm on way to Grampat
No 10 disappeared with
2 1/2 probably 2 miles
probably 3 miles with
glass disappeared
absolutely - No 4

~~not good~~ about same
but not so good 1 2 & 3
dark - This shows
5% is too great a
jump 1 to 2% is most
it is singular they
don't compare
3 is quite dark when
10 absolutely dark

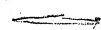
Ang 1/2 may have little to do
with it.

358- 6 & 7 white &
Compassion - 5 & 8 about
same tint.

4 = Now reflections board
twice as high as wide
& more conspicuous
10 & 4 sometimes flash
up very faintly -
past a little beam of
Orient point.

404 - 4 & 10 not seen
other about same

4.13 - all gone havnt but
just look - Forst slants
out very bright & reflects -
we have been living &
are still a little past
abcam of Orient point

Board 6 X 12 white
on S. side like new
(Even when sun
shining on board)
is made brilliant for $\frac{1}{4}$
of it & over whole is
brighter than the sun
direct at ^{acute} angle 

Crayon Pencils (Wax)

In very deep shade blue is next
to black -
Next is Green
Next is Red
Next is yellow but yellow is
very near white,



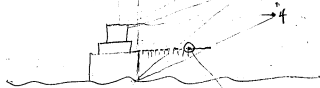
We tried Arc light on board today
Clear western sky board and
Dachem in shadows but rather
light from white houses & boat
near dock. Spot with one
lense $2\frac{1}{2}$ dia - not very bright
would say double brightness
are strong looks hopeless

With Mirrors can get part
of surface very bright

arc + lucandescence probably
hopeless + impracticable
on a clear sky when ship
is in shadow - possibly
lucandescence might make
bright spots all over screen
by using headlight anemometer
for period before sun rises
on pure white boards
but it would only be good
for a little while,

The Mirror is very promising
as far as light is concerned
if it can be made practical
+ follow the sun when sailing
+ pitching, it could be
effectively + irregular which
would help at 4 miles
I think -

For Camouflaging hull when
on sunny side think
could paint hull white
+ then throw it in shadow
by canvas with holes in it
to let them right amount
of light $\frac{1}{2}$ " " " " " "



This could be done up to
3 pm then the light diminishes
from absorption. O'Brien
Work this up -

Tried painting brick on Tin -

Flake white from tube }
Reg Carb lead } Reg lead at, they bist-
Dark white from tins, }
Ba sulfate - ng dirty yellow

I notice in very dark places
tin looked dark + white
looked white but if I
had tin nearly horizontal
tin looked bright + white
at that angle looked black
as compared to tin,

Why?

4:30 pm Viewing board
at angle looking towards
mirror but not at it
Board brilliantly

illuminated in the streak
but looking broadside
very weak - given particles
reflected out into space generally
but when looking at angle
the particles over whole
with board. Concentrate
their rays in a narrow
line & then produce
brightness - This will
be BAD -

Probably necessitate the mirror
being placed along top
of the shutters - If then
may not do it = Expmt.

Excluding Moon

Darkness -

July	H 4, M 19
Aug	5 40
Sept	7 29
Oct	9 7
Nov	10 29
Dec	11 20
Jan	11 29
Feb	10 45
March	9 50
April	8
May	6.19
June	4.40

From Twilight^{sun} to twilight^{RA} English Coast.

		Dark Night			
		H	M	H	M
Jan	5.42 am	11	29	6 13 pm	12 31
Feb	5 32 am	10	45	6 45	12 15
March	4 54	9	50	7.17	14 10
April	4 am	8	-	8 pm	16 00
May	3 01 am	6.19	8.42	17 41	
June	2 12 am	4 40	9 32	19 20	
July	2 07	4 19	9 48	19 41	
Aug	2 50 am	5 40	9 10	18 20	
Sept	3 38 am	7 29	8.09	16 31	
Oct	4 17	7 7	7.00	14 53	
Nov	4 52	10 29	6.23	13 31	
Dec	5 23	11 20	6.3	12 40	

Feb	24	21
March	3	22
"	10	17
	17-	24
	24	25
	31	31
April	7	19
	14	28
	21	55
	28	44
May	5	46
"	12	23
	19	27
	26	10
June	3	18
"	10	32
	17	32
	24	28
July	1	20
	8	17
	15	18
	22	24
	29	21
Aug	5	23
	12	16
	19	18
	26	28
Sept	1	24

Sept	9	18
	16	28
	23	15
	30	13

Sept 19 Thunder no moon

Boat has ok benefit of
18 $\frac{1}{2}$ hours of Camouflage

(Screen & clouds)

9 $\frac{1}{2}$ screen - 9 Darkness

+ more later in season

Notebook Series -- Notebooks by Edison
Notebook, N-17-10-18

This notebook was used during October 1917 by Edison, his personal assistant William H. Meadowcroft, and an unidentified employee. At the beginning of the book is a one-page note by Meadowcroft entitled "Torpedo Boats," followed by several pages of statistical information copied from the 1916 *Shipping World Year Book* and other published sources. In the middle of the book is an entry by Edison entitled "Notes from Consulting board meeting Sat Oct 20 /17." His remarks pertain to the problems experienced by Allied merchant and naval vessels during World War I and the strategies employed to deal with German submarines. Three pages of additional statistical information follow Edison's notes. The front cover is marked "War." The front flyleaf is inscribed "Miscellaneous Information Oct. 18 - 1917 to." The book contains 5 numbered pages followed by 11 unnumbered pages.

Miscellaneous
Information

Oct. 18-1917
to

73498

Ames Co.,

MEG. STATIONERS,

96 JOHN ST.

AND

15 FRONT ST.

Torpedo Boats

Q. How long does it take for a torpedo boat at rest to start and reach full speed?

A. Using 2 boilers 24 knots can be attained in 5 minutes. In 20 minutes this speed can be held and maintained indefinitely.

Q. Do torpedo boats make much motion when running full speed?

A. Oil burners - none
Coal burners - almost always - considerable.

How many oil and coal burners in

American Navy - Oil 58

" Coal - 21

British Navy { Oil 105

" " { Coal 110

" " { no details known

French Navy Oil 24

" " Coal 69

Shipping Data (Shipping World Yearbook
pages 293-296 1916)

British Port	Trade 1913 No. of ships arriving daily No. of ships departing daily	Foreign trade 1913 No. of ships arriving daily No. of ships departing daily	Total Arrivals + departures	
Belfast	7	2	9	
Blyth	2.0	3.0	5.0	✓
Bristol	1.7	1.2	2.9	✓
Bristol and	.7	1.2	1.9	✓
Cardiff	9.8	13.9	23.7	✓
Cole (Barnham)	1.6	.8	2.4	
Eastonmouth	1.3	1.2	2.5	
Dover	3.3	3.3	6.6	
Folkestone	1.1	1.1	2.2	
Glasgow	3.1	5.0	8.1	
Gravel	1.0	1.1	2.1	
Grangemouth	1.3	1.3	2.6	
Grimby	3.2	3.5	6.7	
Hartlepool	1.5	1.1	2.6	
Hull	5.9	5.5	11.4	
Leith	2.0	1.9	3.9	
Liverpool	10.7	10.3	21.0	
Londrina	15.8	12.3	28.1	
Manchester	1.9	1.5	3.4	
Merseyside	1.2	1.6	2.8	
Millwall	2.5	2.5	5.0	
Newcastle	9.1	11.3	20.4	
Newport	2.9	3.3	6.2	
Northfleet	4.3	3.0	7.3	
Port of London	1.1	1.5	2.6	
Southampton	8.3	7.8	16.1	
Swansea	2.1	2.7	4.8	
Warrington	1.2	.7	1.9	✓

Shipping Data (Shipping World Yearbook) 3
British Trade year 1913

Entered from	No. of Vessels		Net Tonnage	Average net tonnage per ship
	Daily Vessels	Weekly Vessels		
Russia				
Port of	11.2	4099	3,594,549	876
Sweden	8.8	3204	2,358,933	735
Norway	9.9	3625	2,176,289	599
Denmark	7.7	2,799	1,860,157	665
Netherlands	27.7	9,359	8,570,797	916
France	42.6	15,527	10,911,454	703
Greece	8.8	3,243	3,405,438	1050
Italy	2.7	976	1,629,136	1670
United States	5.1	1,858	9,083,510	4890
Argentina Republic	2.8	1,007	2,991,591	2970

Shipping losses Steam Vessels.

Cause	# Vessels lost yearly	Total # Vessels employed	% of loss	Relative to Submarine
Submarine	1200	17,037	7.04	100
Mine	96	16,013	.60	8.52
Collision	42	16,013	.26	3.69
	Submarine lost	Submarine employed		
Submarine	3,644,000		8.65	100
Mine	173,635		.65	7.52
Collision	45,012		.17	1.96

Summary of mine and collision from
1911 Report of U. S. Commissioner of Navigation

Submarine sinkings. Barcelona sinkings
Feb 1 to Oct 1-1917 Courts of England
and France.

Nationality of ships involved
British Bremen

" German

Danish

Dutch

French

Norwegian

Russian

✓

Route - Hours knots

hours	20	18	16	14	9.5	8.5
3.5	70	63	56	38.5	33.2	29.8
9.0	180	162	144	99.0	85.5	76.5
11.5	230	207	184	126.5	109.2	97.8

Above figures are nautical miles.

Prison	20	12	8	5
Mouth of path	40	24	16	10

January 1917 - Whitaker Almanack

Sunlight	3.5 hours.
Daylight	9 "
Night	11.5 "

Notes from Consulting Board
Meeting Sat Oct 20/17

1st Step to Cope with Subm.
Send vessels with high speed

2 Zig Zag

3 Escorting all Capital ships by
Navy + also important Merchant
ships -

Slower ships are helpless + are
torpedoed -

Nobody recognized seriousness of
Submarine Menace but soon
found out it was of primary
importance -

Camouflage then came in by
Smoke screens etc Escorts, Convoys.

Submarines out to 20° W
but 17° 10' E is about limit of
practical Operations but this
will be increased considerably by bringing
out the large Cruising Subs now held up
by training crews but will soon appear

greatly increases the Zone

Arming of ships in combination with Patrol Escort has kept submarines below the water. There is very little gun fire from submarines now, it is now necessary for them to use more torpedoes.

Germans much afraid visiting Merchant ships in which guns concealed. - Can see any indication of a gun, but they have Bomb throwers, guns etc when stopped by a Subm. by signal or otherwise they all abandon ship & get clear to induce the Subm. to come up & bomb her. Then away flies beside of the ship, & a good big gun & crew revisited this gets the Subm & it works. Some officers stayed by his ship until it was almost sunk but he got the subm.

There are 6 of these ships in a row at Edinburg & they are building more. The Germans are very much afraid of them -

On one ship the Decs tried to find out by external & internal inspection if any gun located. Capt clapped his hands & a big gun & crew came into action from "No where"

Guns under deck hatch. Elevated by removing hatch. Crew in water closets & all manner of places, to hide guns & communication -

Speaking of a boat I suspect she had 2 monitors for bombs & bombs had depth fuses and fire control station between pilot house & other works -

Every little fishing craft,
dirty clabby looking craft
are equipped with powerful
torpedos & guns all waiting
for Subs.

Aircraft control is in a
Complete Operation as the
supply of aircraft to Navy
would permit -

If an aircraft is patrolling
with depth charge torpedos
submarines won't come up
for long. The aeroplanes
work 60 miles from shore.

The tendency is towards
lower sea planes (aeroplanes)
They get as low as possible
above the subm -

They use aeroplanes to
patrol the Channel route

The thousands of vessels
that move are going across
the channel they have not
lost a man from escorted
ships -

They escort the vessels all the
way down the coast to the
Mediterranean. There another
Convoy picks them up,
The Mediterranean Convoy is only
recently organized.

No matter how successful in
defensive must take offensive
to succeed.

Offensive Methods a Mining
Operation off Heligoland flight
Very hard to operate there
because sea is rough so rather
haphazard. The combined mining
operation has resulted in the
whole place being filled up by
German & allies - so its

Mined 100 miles out of Heligoland
Therefore Cant successfully
lay a mine Barrage
around Heligoland

Subs not exit from
Zurbergge + Island

The largest go out there
Danish neutral vessels

They have a lot of English
subs up on Danish Coast
to hunt the German Subs,
& they have been fairly quite
successful in laying
submerged in shallow water
with periscope out looking
for passing German
submarines.

No mine sweepers can get within
30 miles of Heligoland

British fleet cant get into
Baltic except at great risk
so England cant help Russian
British have only 7 subs in
Baltic now - Even if fleet
could get in would be probably
be bottled up by Germans

English have very fast motor
boats 60 ft long with one
torpedo over stern, arriving in
same direction boat is going
drops torpedo over stern in
same direction boat is going

Have gotten into the male
of Zurbergge + damaged the
ships there somewhat.

England shy on large aeroplanes
Germans have command of the air
on Zurbergge Coast. Escort
their submarines out of Zurbergge
by aeroplanes

Shires are slightly ahead
on Bacc's front but Grooms
are speeding up

Lectionnaires have to keep on
surfaces for ~~at~~ at least
20 miles to clear the
Chicals at Zerkurgas.

Of the 210 accidents to Vessels
at Sea reported in
Woolless Year Book of 1917
only ten were due to
fog - of 5% -

Daily Arrivals and Departures French Ports 1913

Steam Vessels

Tonnage and Ballast

(to nearest whole No)

Ports	Arrivals	T.G.	Antwerp	Amsterdam	Brussels	London	Paris	Antwerp	Amsterdam	Brussels	London	Paris	Totals
Antwerp								1	1		1	4	7
Calais								1				11	12
Boulogne		1		1							11	13	
Breast											2	2	
Honfleur													
Norman		1	1	1	2	2	2	22				31	
Caen		1						4			4	5	
Auberg											4	4	
St. Malo											1	1	
Brest											4	6	
St. Nazaire											2	4	
Nantes											1	1	
Bordeaux								1	3			4	8
Dieppe											9	9	
La Rochelle											1	1	2
Bayonne											1	1	2
Totals		3	1	2	4	4	10	78				102	

Sweet Breton - 315

St. Nazaire 24

Mont St. Eloi 12

129, 000 Voyagers per year

4

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230

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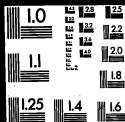
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